Consulting Engineer

October 1961

Photo by Fabian Bachrach

MURRAY A. WILSON, director of Wilson & Company, Engineers and Architects, Salina, Kansas, believes that all engineers have one thing in common: they devote their lives to spending other people's money. Starting from this half-facetious premise, Wilson has spent a lifetime of extracurricular activity seeing to it that engineers spend wisely. There is no better qualification for his current role as president of the National Society of Professional Engineers.

Continued on page 10

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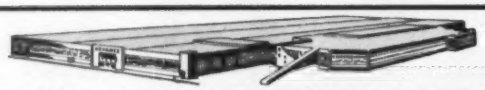

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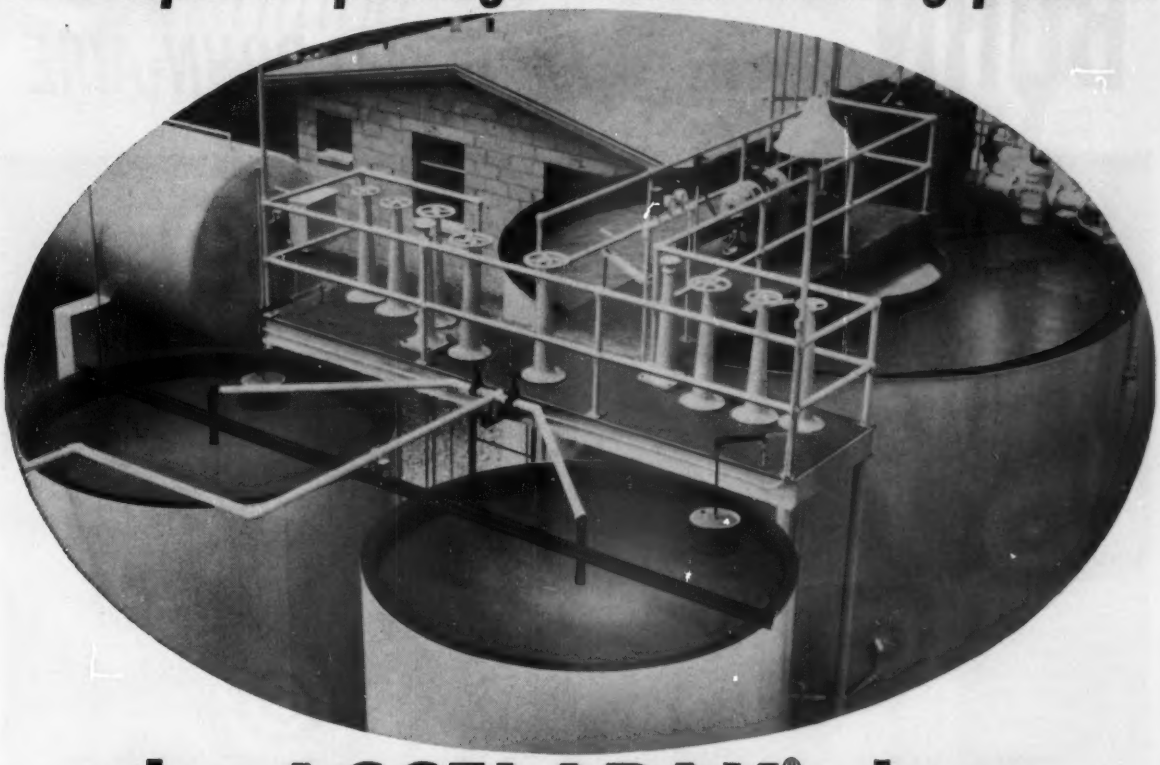

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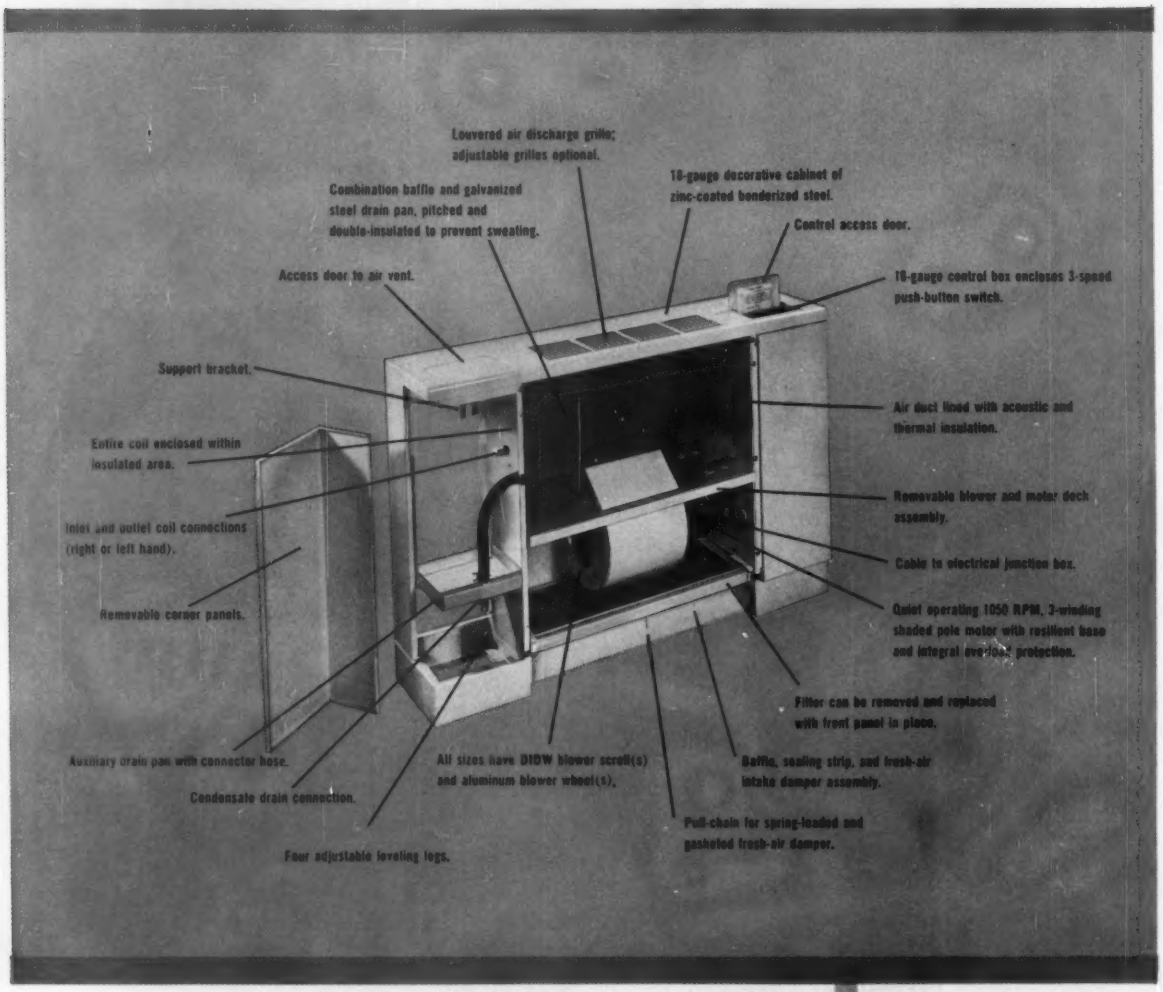
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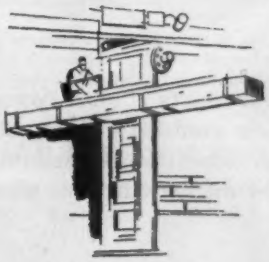

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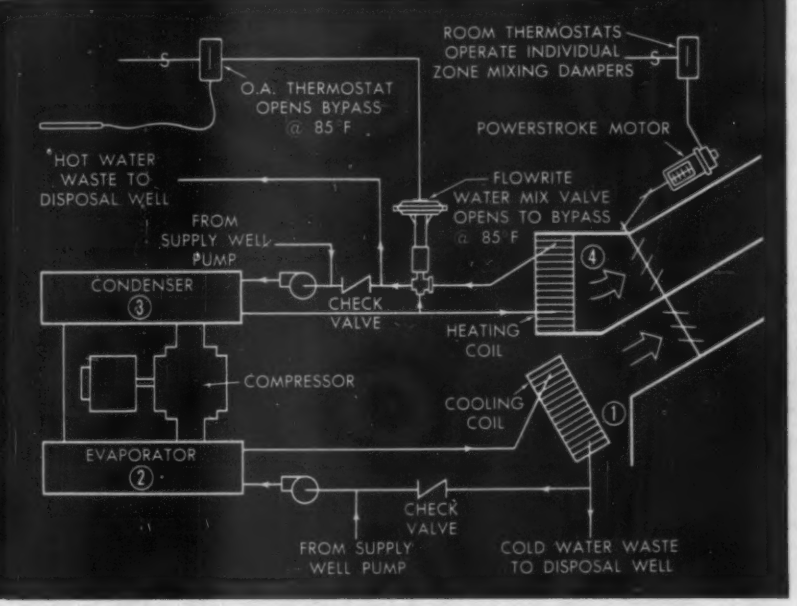

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MURRAY A. WILSON

– Starts on front cover

As a consulting engineer, Wilson feels that the NSPE functional sections for engineers in private practice have a goal which is identical to that of the Consulting Engineers Council. In fact, he believes quite firmly that the two groups must and should cooperate. However, his personal allegiance lies with the consulting engineers section of the National Society of Professional Engineers. As Wilson puts it, "Consulting engineers are a numerical drop in the engineering bucket. While it is true that they are going to encounter conflicts of interest with engineers in other fields of activity, they cannot expect to be effective on the national level without the blessings of the entire engineering profession. Intraprofessional differences must be resolved in a friendly fashion within the family circle. Congress will listen to NSPE."

As the new president of NSPE, Murray Wilson feels that his most important function in the coming year will be to strengthen the Society's state and chapter organizations. NSPE's goal prior to 1960 was to establish connections in every state and territory of the United States. According to Wilson, "This goal has now been achieved, but the development of local groups is spotty. We need to strengthen and encourage local groups to work for themselves, but until that is accomplished some of the local officers are going to need a great deal of help from the national organization."

Professional Ethics for All Engineers

After 11 years as a member of the Kansas State Board of Engineering Examiners and six years as a member (including 2 years as chairman) of NSPE's Board of Ethical Review, Wilson has developed some very strong opinions about engineering ethics. He is deeply concerned over the fact that most engineering codes of ethics appear to be beamed directly at the engineer in private practice. As he says, "our codes are patterned too much after those of the doctors and lawyers. In principle, they apply to all engineers, but we need to do an important promotion job if we are to convince the great numerical majority of engineers in government and industry that they should be interested in a code of engineering ethics. It is not so much a matter of philosophy as it is semantics. We need to examine our use of words to see if existing codes can be expanded and interpreted so that they will be universally applicable."

Of course, Wilson is well aware that having a code and observing a code are two different things. However, he is confident that the right kind of code can be implemented by the example of outstanding engineers and the persuasion of local engineering groups. But he is not so naive as to rule out the possibility that some recalcitrant engineers will have to be kicked out of the organization for grievous offenses. Wilson is not exactly sure who will bell the cat, but he is confident that, within the framework of NSPE, a fair and efficient procedure can be developed.

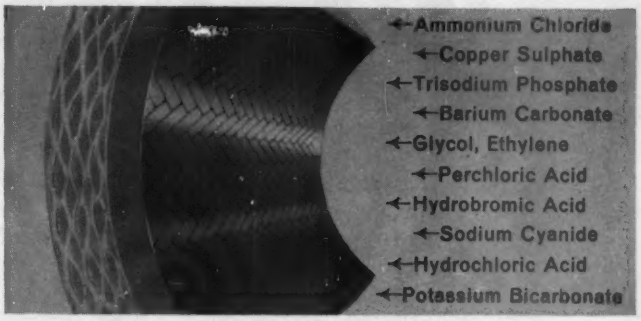
"We recognize," says Wilson, "that students in medicine and law get a much more thorough indoctrination in the ethics of their profession than do engineers. NSPE has taken a great interest in this, as has the Engineers Council for Professional Development and the National Council of State Boards of Engineering Examiners. Personally, I have visited a number of engineering schools in recent months, and although I have detected some weakness in the professional outlook of engineering faculties, I have no doubt that progress is being made. As a former teacher, I am a great believer in our fundamental principle of academic freedom, and I do not think we can push our engineering faculties into a great crusade for indoctrinating young engineers with a strong spirit of professionalism. However, I have a great faith in our engineering faculties, and I am sure they are becoming increasingly aware of, and willing to fill in, this gap in our engineering curricula."

Government in Engineering

When Murray Wilson and Robert J. Paulette found themselves among the unemployed in depression-ridden 1932, they got together to form the consulting engineering firm of Paulette & Wilson. At that time, it seemed that if any engineering was going to be done, it was going to be done by the government. A personal friend warned Wilson, "You are making a very foolish move, for within 10 years there will be no such thing as a consulting engineer – the government will be doing all the engineering work." For a time, Wilson conceded that his friend's prediction appeared to be disconcertingly accurate. However, eventually the firm prospered, as did the consulting engineering profession in general.

Along with most consulting engineers, Wilson is concerned about the mushrooming growth of state and Federal engineering bureaus. However, he tends to view the problem in the broad perspective of history. "After all," says Wilson, "we were afraid of government competition in 1932, and after World War II there were many experts who predicted that it was only the war which saved consulting engineers. Today, we are stronger than ever before, in spite of the rapid build-up of state highway departments. What we have lost in one area we have gained in another, and I am really not afraid that we will see a permanent growth in government engineering."

As Wilson views the situation, there is room for both government engineers and private practitioners. If there were no government engineering bureaus, Wilson feels that consulting engineers might now be



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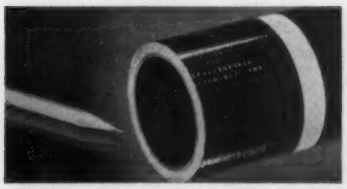

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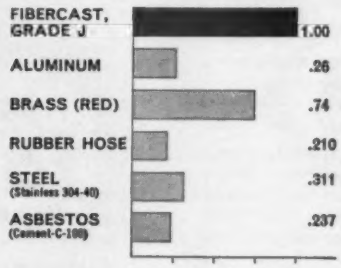

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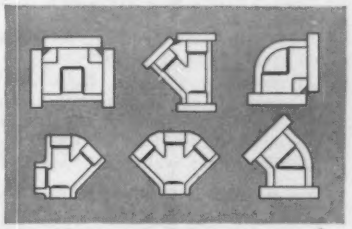

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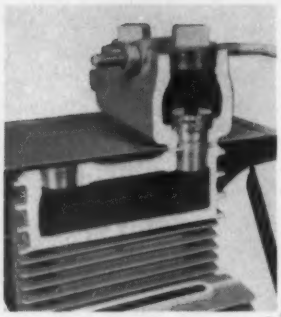

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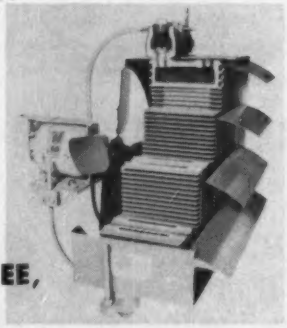

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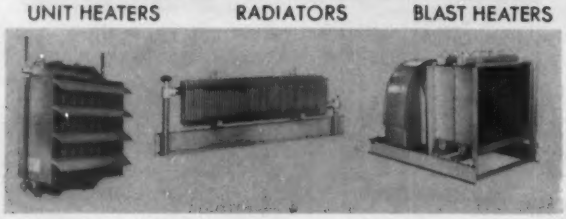

in the same boat with some of the electrical equipment manufacturers – they would be under investigation for fixing their prices at levels detrimental to the public welfare. Actually, the public benefits from the existence of consulting engineering firms, for the cost of their services establishes a good basis for evaluating the efficiency of the government bureaus. By the same token, each prevents the other from falling into a straight jacket of complacent conservatism. New ideas, Wilson feels, are best conceived in an atmosphere of friendly competition between the government bureaus and private practitioners.

Nevertheless, Wilson concedes that there is a trend toward government engineering and that it may take a long time for some of the bureaus to return to normal after currently heavy design loads have been worked off. For example, it is his guess that it will take 10 to 15 years to accomplish this in our highway departments after the completion of the Interstate Program. People will not leave because they are fired, but because they are retired.

According to Wilson, the real future of the consulting engineering profession will be decided on the basis of its ability to do good work. Thus, while Wilson feels that consulting engineers have a perfect right to express their opinion of the current expansion of government engineering activity, they can do more to promote private practice by setting their sights on high standards of performance. For example, while some manufacturing corporations are expanding their plant engineering departments, others are headed in the opposite direction. Many factors may be involved, but one of the most important, in Wilson's opinion, is the relationship which the corporation has had with consulting engineers in the past. The opinions of government agencies and plant engineers about consulting engineers, whether pro or con, often are based on a single experience.

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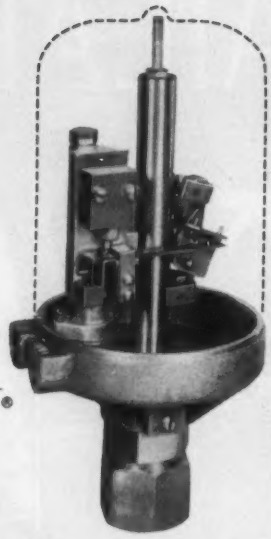

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In the Magnetrol J-2 you get all the benefits of Magnetrol's unique magnetic operating principle applied to pneumatic ON-OFF, single-stage control of liquid levels . . . Dual magnets position a 3-way stainless steel valve—provide snap-action and positive holding even under heavy vibration. All metal operating parts are of stainless steel or aluminum for maximum corrosion resistance and are enclosed in a splash-proof housing. Suitable for all common temperatures and liquids. J-2 Switch Mechanism can be used with practically all Magnetrol units to provide reliable pneumatic control.

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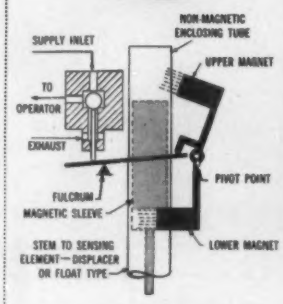

Magnetic sleeve, inside nonmagnetic enclosing tube, rises or falls with changing liquid levels. Attracting sleeve is always in field of upper or lower magnet. (Shown, low-level position.) Lower magnet is "pulled" in, supply inlet is open and air or gas flows to operator. On rising level, sleeve attracts upper magnet. In this position lever and fulcrum arrangement cuts off supply and allows air or gas trapped between operator and valve to exhaust to atmosphere. Reverse action can be provided by simple adjustment in the field.

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Please send Catalog data and full information on Magnetrol J-2 pneumatic Liquid Level Controller.

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a hand-to-mouth existence with only a fair chance for financial success – but it offers a wonderful opportunity for engineers to work in an atmosphere of individual freedom and independence of judgment. To those who take the time to investigate the firm, however, Wilson & Company is a good risk. Almost half the employees have been there for 10 years or more.

Wilson & Company depends on three prime sources for new employees. The obvious one is young engineers just out of school who recognize the diversity of experience they can gain in a consulting engineering firm which cuts across the traditional fields of engineering. Another good source is the large group of disillusioned young engineers who have put in a few years in the glamour industries only to find that, though they were promised the moon, they have hardly been able to get off the ground. The third group of employee prospects consists of those young men who need training as technicians and who may or may not go on to become full-fledged engineers.

Wilson & Company's home base is Salina, Kansas, and that is where the majority of the work is done. However, there are presently branch offices in Omaha and Wichita, to maintain good communications between the home office and specific project sites.

A Man With a Mission

At 67, Murray Wilson could rest comfortably on past laurels – both professional and private. That he has no intention of doing so is obvious even to the most casual observer. Though it is more likely the other way around, Wilson acts like a man who owes a great debt to his profession. He seems determined to pay off with interest, and it is evident that NSPE will benefit – as will the profession in general.

Wilson has held every major office in the Kansas Engineering Society and the Kansas Society of Professional Engineers, before these two organizations merged. He is also a Fellow in the American Society of Civil Engineers and a member of the American Institute of Consulting Engineers. His abiding interest in education is evidenced by the honors he has received from Kansas institutions of higher learning. There is a "Murray A. Wilson Hall for Men," at Kansas Wesleyan University, and he holds an honorary degree of Doctor of Humane Letters from that same school. Wilson also was honored by his alma mater, Baker University, with a distinguished service award.

Wilson has led a full professional life, but his private and public life have been equally rewarding. He has been an active member in many lodges and clubs, and presently is serving his home community through the Salina Chamber of Commerce Industrial Development Committee. But the greatest honor of all, Wilson confesses, is one he shared with his wife last August. As delegates from Kansas, they traveled to Oslo for the World Methodist Conference. ▲▲

There's more for you in this package than dependable diesel electric power

From your first thought on, everything you need to recommend satisfactory electric set power comes in the Caterpillar package.

You'll find basic information on Cat Diesel and Natural Gas Electric Sets in Sweet's.

Caterpillar Dealers, with over 800 stores in the free world, can give you additional specifications and complete prices. And their experience in power requirements covers all kinds of applications and installations. Your Cat Dealer can save you time.

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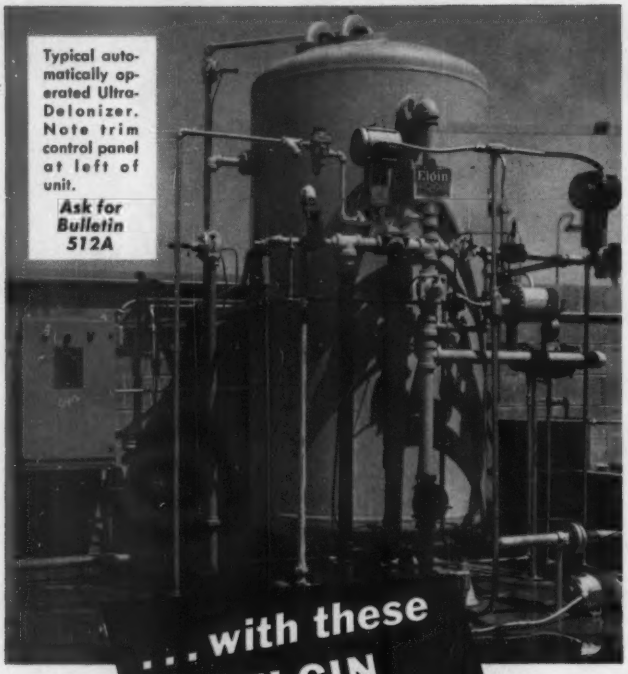
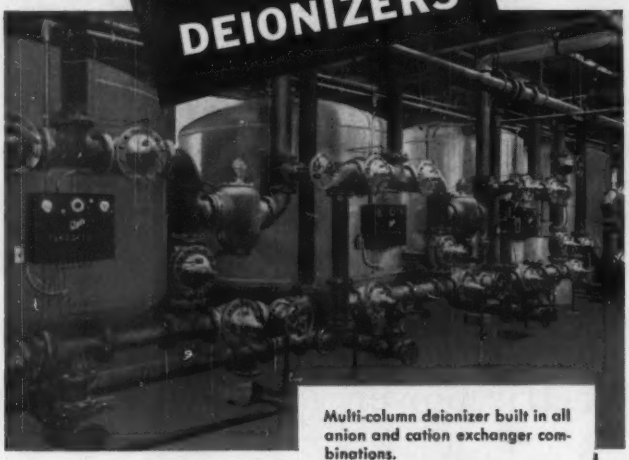


Typical automatically operated Ultra-DeIonizer. Note trim control panel at left of unit.

Ask for Bulletin 512A

...with these ELGIN DEIONIZERS



Multi-column deionizer built in all anion and cation exchanger combinations.

Ask for Bulletin H4

—from equivalent of distilled up to 18,000,000 ohm quality

Whatever the quality of water you need—even up to 18,000,000 ohm purity—Elgin can supply the correct type and size deionizer to deliver it. Standard mixed-bed Elgin Ultra-DeIonizers are capable of producing water having an average of less than 0.5 ppm total ionizable solids, a specific resistance averaging in excess of 1,000,000 ohms and free of silica and CO_2. Employing special ion exchange materials, Ultra-DeIonizers are also built to deliver water of up to 18,000,000 ohm quality.

Elgin multi-column deionizers in various anion and cation exchanger combinations, both with and without degasification and mixed-bed "scavenger" units, are also widely used to provide water of any chemical purity desired.

While all Elgin deionizers are available in standard models, most buyers choose the exclusive Elgin "Double Check" type because its ingenious manifold arrangement (1) guards against loss of valuable ion exchange material (2) permits a deeper demineralizing bed (3) allows more effective backwashing (4) increases regeneration efficiency. This all adds up to a marked increase in high quality water output.

Whether for makeup purposes or processing requirements, chemically pure water delivered by an Elgin Deionizer costs so little considering the big job it does. And from simple manual control to fully automatic operation, you can rely on Elgin equipment to give that uncompromising quality and trustworthy service for which Elgin has been known more than a half century.

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This new, plastic enclosed, single-lamp Visionaire® forms a matching complement to the 2 and 4-lamp #7400 STARAMA series. Now architects, engineers and building owners can plan a unified lighting system from narrow corridors to large spaces with fixtures of the same style and lighting characteristics.
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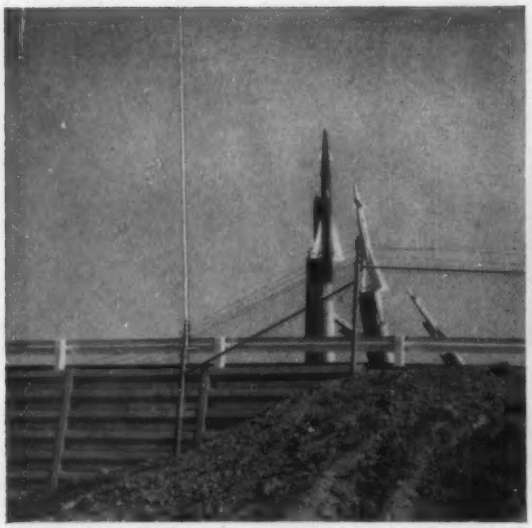
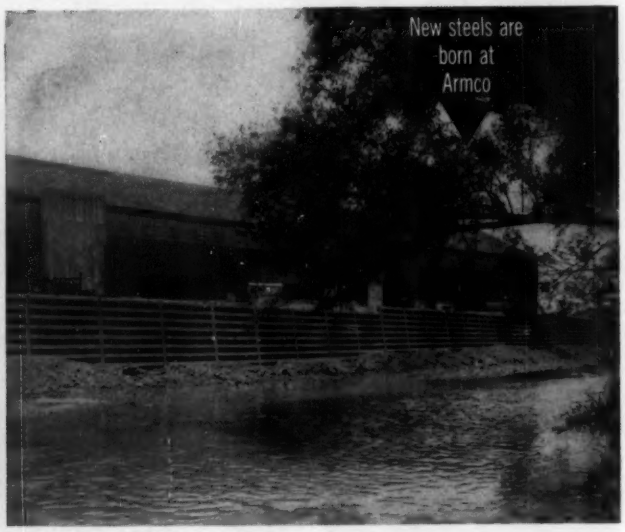
for strength, economy, durability



Armco Wall helps expand area required for missile launching pad on mountain top.



Armco Wall helps convert wasted stream slope into flat area for building site.

Whether more room is needed for a mountain-top missile site, a highway on a hillside, or just extra space for a parking lot — an Armco Bin-Type Retaining Wall is likely to be ideal for the job.

Deeply corrugated members formed into bins and all-bolted design assure integral strength of the wall. Backfilling the bins with earth provides stability. Engineers say that Armco Retaining Walls may cost as little as half that of conventional walls. They have been widely used for 30 years and have an excellent durability record.

Armco Walls are used to support unstable slopes, serve as bridge abutments, prevent shore erosion, make maximum use of right-of-ways, and create useful flat areas from unused slopes. Wide size range. Write for new catalog. Armco Drainage & Metal Products, Inc., 5371 Curtis Street, Middletown, Ohio.

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Readers' Comment

Corporate Practice . . . General

Corporate practice laws (including the new Illinois Act) are seriously deficient in tacitly omitting restrictions on the directors [of an engineering corporation] to appoint unlicensed persons as officers — president, secretary, and treasurer. The officers actually run the corporation, direct its operations, sign contracts which commit the corporation, and have the power to bind the corporation in the practice of professional engineering. The directors may make policy and appoint the officers, but they are subject to close control by lay share owners, and a director may be removed at a moment's notice.

Not only do the laws fail in performing the vital function of releasing the engineer (a majority of directors and the chief executive officer must be engineers) from the control of his professional acts by laymen, but the practice of professional engineering by laymen is legalized.

Leonard M. Todd
Consulting Engineer
New York City

Corporate Practice . . . Specific

As a professional engineer I am writing to you in regard to two articles by D. Melvin Nord which appeared in the . . . May and June, 1961, issues. It is shocking to me that a magazine of the caliber of CONSULTING ENGINEER publishes these articles, which are not only supercilious and superficial in their treatment of matters of great concern to large segments of the engineering profession, but also contain so many inaccuracies that the picture presented bears no resemblance to the actual facts.

I feel it incumbent upon me to comment on Dr. Nord's remarks dismissing as "hogwash" the theory of professional responsibility provided for in the current Washington laws. In stating that the man who holds the purse strings is the one who ultimately controls, "even from a strictly engineering point of view," Dr. Nord has, in effect, characterized the professional engineer as being not only venal but completely unprincipled, and in fact totally unprofessional. This I absolutely deny. If pure economics did in fact control engineering judgment, I see no reason for supposing that an individual consulting engineer with the prospects of a large fee from a corporate client would be any more or less independent in his professional thinking than a professional engineer employed on a salary basis by an engineering corporation. The facts are, of course, that every professional worthy of that classification, whether he be an engineer, a lawyer, or a doctor; and a sole practitioner, a partner, or a corporate employee, not only should but almost universally is totally unwilling to act against his professional judgment for material gain.

Furthermore, in dismissing the theory of the Washington law as "hogwash," Dr. Nord in his ivory tower is also dismissing with a wave of his hand the laws of 36 states which currently permit by stature the corporate practice of engineering under the general proviso that the work be under the responsible charge of or carried on by professional engineers, [and of] six additional states which interpret the laws of those states as permitting corporate practice under similar conditions.

R. P. Westerhoff,
Ridgewood, N. J.

Public Relations

As chairman of the public relations committee of the Consulting Engineers Association of Colorado, I am kindly requesting that you forward to us 40 copies of your coming edition.

We feel that these additional copies will help the Consulting Engineers Association of Colorado in its public relations work and will assist the profession.

I B Falk Jorgensen
CEA Colorado

Ethical Practices

Mr. Lobo's article "Confidential Information" (July 1961) makes very good reading. And I am impressed by the solution he submits for the problem discussed, namely "Canons of Ethics for Engineers," (in this case, Section 14).

The best definition of ethics is not found under the word "ethics" in the dictionary, but under the word "right," as follows:

> RIGHT, N,1 — That which is right or correct, specifically adherence to duty; obedience to lawful authority; freedom from guilt, spec. ETHICS.

Taking these three phrases in reverse order, they spell out the elements of freedom in our de-

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mocracy. "Freedom from guilt" implies that *Regulations* of our own choosing have been enacted to protect the rights of all. "Obedience to lawful authority" implies that these regulations have provided *Restraints* to which we are answerable. "Adherence to duty" implies that all of us have a *Responsibility* to initiate and participate in the application of restraints when regulations are violated. By assuming this responsibility, instead of being apathetic, we give meaning to the preamble of the Canons of Ethics for Engineers:

"The engineer should recognize such a standard, not in passive observance, but as a set of dynamic principles guiding his conduct and way of life."

These are the three R's not properly taught in our schools and colleges, and therefore not adequately practiced in this country today. This condition is referred to as the "breakdown of moral standards," which threatens our freedoms. Our freedoms are in jeopardy from within on the left, and from without.

The more freedoms we surrender, the more likely we are to become subject to a great White Father, in the hope that he will be a Benevolet Despot.

Therefore, it is an obligation of professionals, individually, to be:

ETHICAL, adj. 2 — Conforming to professional standards of conduct.

Lindsay H. Welling
Consulting Engineer
Scarsdale, New York

Status as a Profession

A small incident may serve to point out why the engineering profession will never achieve the stature and coherence represented by the AMA and the Bar Association.

The A*** claimed that I owed them $2 for a number of papers; I contended that the bill had been paid. Eventually, I put a check into the mail for the amount in question. About this time, however, the A***, unknown to me, notified my company (one of the big ones) that the company would receive no more A*** literature until the bill was paid. The accounting department promptly paid, to avoid a holdup in delivery of needed information.

Wouldn't this incident seem to sustain the contention that the engineering profession lacks professional dignity? Incidentally, I've been paying dues to the A*** for a good many years.

(Name and affiliation withheld on request)

More on Turnkeys

I was interested in reading the comment by Mr. Edmund B. Besselievre, of Dallas, regarding the "Turnkey Controversy." He presents an interesting argument, but fails to point out an extremely important factor. It would have been helpful if he had indicated to what extent private industrialists contribute their own sense of responsibility to the planning of a new extension or the building of new facilities.

This area of responsibility disappears to a very large degree in the field of public programs at the local, state, and Federal levels. Granted that these public bodies maintain a staff [of] conscientious engineers, the fact remains that political pressures generally assume an overriding control. In such cases the consulting engineer must give independent advice and be prepared to say "no" when this is the right answer to serve the public interest. Much of this independence has disappeared in the past when the advocates of "turnkey projects" see the possibilities of landing a large design and construction contract. Furthermore, one need only examine some of the reports on foreign aid programs to see to what extent the availability of money has led to the abandonment of professional disciplines of first determining whether the ultimate objective of a particular pro-

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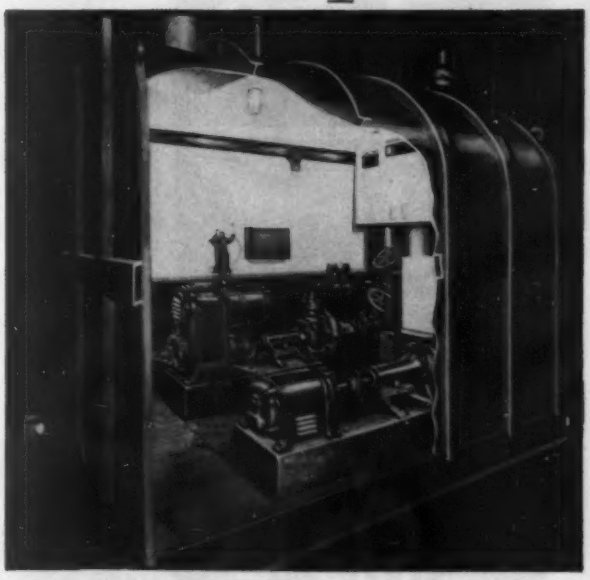
The Revolutionary Rectangular-Shaped Packaged Pump Station

TEX PACKAGED QUAD PUMP STATION



TEX-QUAD is designed to fit the equipment!

For years manufacturers have been forcing bulky sewage pumping equipment into round or oval stations when the equipment is designed for a rectangular station.

TEX-QUAD is designed for the operator!

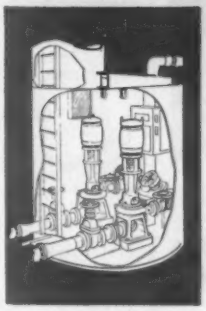
The servicing of a pump or motor is frequently a two-man job. In "old style" stations, this function is hindered. With the TEX-QUAD operators are given every consideration!

TEX-QUAD "Level-Line" pumps increase serviceability!

Its rectangular design permits the use of horizontal pumps which eliminates the suction elbow found on vertical pumps. This improves the hydraulic flow in the suction inlet of the pump.

TEX-QUAD can provide more room for future additional pumps!

Its new shape allows for the addition of pumps and motors as needed. Depending on the size station, as many as five pumps can be used to handle a total capacity up to 10,000 GPM!



ROUND PUMP STATIONS, TOO!

TEX-VIT's Round Pump Station gives you extra rugged design, construction and dependability, too. Its four-bearing pump assembly with Flexible Coupling is housed in a heavy steel, water tight shell.

This station's exclusive features assure maximum dependability and simplify future modification.

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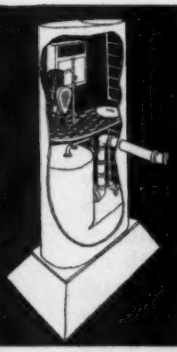


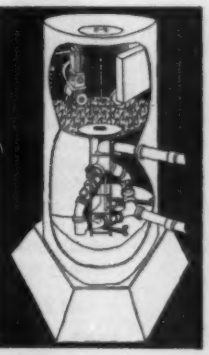
ELLIPTO-JECT or DELTA-JECT

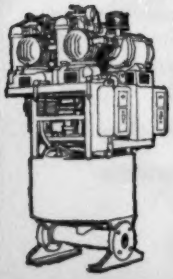
Packaged Pneumatic Sewage Lift Stations

Both packaged stations perform the same function. But the ELLIPTO-JECT is a simplex pneumatic ejector station, and the DELTA-JECT is a duplex station.

Their heavy steel shell-within-a-shell design provides maximum protection for the air storage tank, sewage receiver, controls and other components.

Available in 20 to 200 GPM capacities, both stations will handle large solids and operate odor-free (because they are hermetically sealed). They feature a wide degree of flexibility and are easy and economical to maintain. Each performs without troublesome bar screens, grinders or moving parts in the sewage.





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Pneumatic Sewage Ejector

This simple, highly-effective mechanism lifts sewage by means of compressed air. It eliminates many disadvantages inherent in centrifugal pumps.

Because there are no moving parts in contact with sewage, maintenance is held to a minimum. Without the use of bar screens, the EJECT-ALL will handle any solid that can pass through the house service line. It is available in 20 to 600 GPM capacities.

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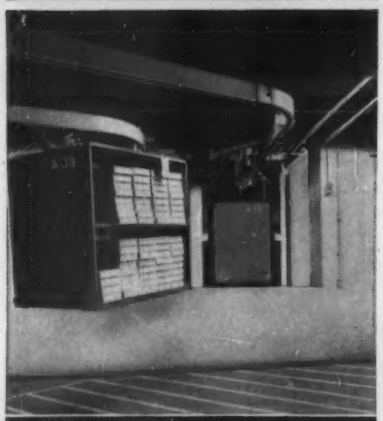
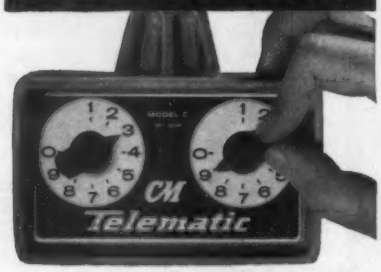


WITH **TELEMATIC**
AUTOMATIC DISPATCH CONTROL



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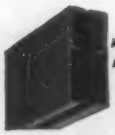

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gram will actually be serving the best interests of the public.

Undoubtedly there are many public officials who are not equipped to evaluate the merits and justification of particular projects and who would welcome competent advice on whether such projects should be undertaken or not. However, they seem to be having a difficult time in finding engineers who are willing to oppose unsound programs. The advocates of "turnkey engineering and construction services" are more inclined to say, "we are here to give them what they want." This is quite different from the situation where a competent industrial manager will ask, "Show us what is best for us, and prove it," which apparently is the type of "turnkey services" which Mr. Besselievre has described.

Adolph J. Ackerman
Consulting Engineer
Madison, Wisconsin

Government Engineering

I was deeply impressed to read in the July issue of CONSULTING ENGINEER of the aggressive steps being taken by the consulting engineers in New Jersey and Oregon to combat the inroads of government into the field of private engineering practice.

It has been my opinion that no solution to this problem will ever come about by any agreement or policy established within the engineering profession itself. We are simply too small, too divided, and too timid to achieve any measure of effectiveness against the forces of bureaucracy and socialism. We must seek outside assistance and support from other groups who are not presently aware of our problem. If we cannot expect unity of the engineering profession within the foreseeable future, we should at least seek some type of unity of the forces that are fighting the growth of government engineering staffs in competition with private engineering practice. . . . We know the problem, we have analyzed it, but as yet no definite program has been set up to combat it and provide a satisfactory solution.

The primary question naturally is, "who should direct such a program for us?" It is my belief that the Founder Societies would be completely ineffective, as the very people we must fight are in the majority in most of the Founder Societies. Neither could NSPE be effective for the same reasons. This leaves only the consulting engineers themselves.

Assuming the effective leadership and organization could be established by the consulting engineering profession for this task, responsibility for its execution could be delegated back down the line to consulting firms throughout the country. The program which I visualize would involve three basic steps which could be undertaken simultaneously:

¶ The first step would be direct contact with all elected national, state, county, township, city, and village officials. This contact must be on a personal basis with sufficient time to explain our problem. This job could be undertaken by individual members of consulting firms throughout the United States and coordinated through their state consulting engineers association. We should aim our biggest guns at the best source of support, by asking company presidents to make the contacts on national levels and lesser engineering executives to make the contacts at local levels.

¶ The second step would be an educational campaign within the colleges and universities of this country, on both the engineering faculty and engineering student levels, to acquaint them with the consulting engineering profession and its operations. Not knowing the benefits and rewards to be gained from private practice, many faculty members become excellent recruiting agents for the bureaucrats, and poison the minds of their

Do you have an answer for Mr. Quibble?

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Mr. Quibble is a well-meaning school executive.
He believes in air conditioning and would like to have it in his new school.
But he is apprehensive about the opinions of board members and taxpayers.
So he is apt to forego this basic requirement for maximum learning and
build a school that will be sadly lacking through the coming decades.
Only his architect and engineer can show him how to have air conditioning
with proper regard for economy and without sacrifice of beauty and utility.
The revolution in education is bringing a revolution in schoolhouse design
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students with the security and stability afforded by government jobs. We must, therefore, institute a personal contact procedure with faculty members much the same as I have outlined for elected government officials. In conjunction with faculty contact, our representatives should also appear before student engineering groups to explain in detail just how the consulting engineering profession operates and how large government engineering staffs are in conflict with the basic American free enterprise system.

¶ The last step would be a general educational campaign to make the public-at-large aware of our problem and how it affects them. So far, I have mentioned only time which the individual must contribute, but for this last step he must also contribute money. Just how much, how soon, and how often would be difficult to determine, but the importance of this effort would exceed that of the other two. I would roughly estimate the assessment of $500 per firm per year would be a modest beginning. There could, of course, be considerable free publicity gained by "leaks" to newspapers of incompetence, poor construction, graft, and misuse of public property by government engineers. The question of ethics naturally arises in suggestions of this type, but my own feeling is that if a member of our profession working for a government body can stand up before it and preach the economies to be gained by empire building, without the slightest proof of his statements, then fellow members of the same profession have a right to utilize comparable tactics to destroy him.

Assuming that these suggestions are accepted and put into operation, I believe our aim should be the following:

¶ Seek policy or legal limitations on the scope of work to be performed by governmental engineering staffs.

¶ Seek to upgrade the salary and professional status of members of the profession working for governmental agencies operating under these limitations.

¶ Require registration of engineers holding responsible engineering positions within any government agency under these limitations.

¶ Seek to remove engineering positions from political control within governmental agencies operating within these limitations.

In conclusion, I would like to again emphasize that there is no easy solution to this problem. A program of this type [could] make enemies of many former friends, but it need not if it is approached with a sense of dedication to the profession and sense of our responsibility to the public.

Donald A. Walsh
Chief Civil Engineer
Meissner Engineers, Inc.
Chicago, Illinois

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Shopper stopper of steel. Long before the Preston Royal Village Shopping Center in Dallas, Texas, was completed, this unusual *curved* steel roof was attracting hundreds of potential customers. This supermarket roof, using structural steel in striking Lamella construction, is just one part of the $2,000,000 center. The vast supermarket building alone encloses almost 20,000 square feet of shopping space containing one of the most complete displays of food in the Southwest. And there isn't a column or post in the entire sales area. The Lamella construction was by Roof Structures, Austin, Texas.

USS United States Steel

TRADEMARK

See next two pages

"Steel fastest, most economical." Speed of construction, low cost and reduced fire insurance rates were the main reasons why Structural Steel was used to build the 25-acre Preston Royal Shopping Center in Dallas, Texas. "Structural Steel in this type of construction is year-in and year-out the fastest and most economical method of framing in this area," the contractor said. "The quicker erection time with steel was figured in on this project from the very start." Readily available and speedily fabri-

Interesting details — Preston Royal Village. The $2,000,000 shopping center is one of the largest in the Southwest—110,000 feet of floor space. This first use of steel Lamella construction in this area eliminated columns and permitted a gracefully curving roof for the main building. 26 businesses, including a theater, restaurant and service station, are housed in the shopping center . . . and fast erection with structural steel permitted early opening for all of them.

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The Word From Washington

EDGAR A. POE, Consulting Engineer Correspondent

Louisiana Consultants Attack Whitton

Federal Highway Administrator Rex M. Whitton is studying a complaint from Louisiana consulting engineers. The Louisiana Engineering Society, through Alvin M. Fremherz, of New Orleans, chairman of the functional section, has written the Administrator:

"We have known for a considerable time . . . that the Bureau of Public Roads refused to approve a high level bridge . . . on the Interstate route through New Orleans, if it was to be designed by a firm of consulting engineers. [The Bureau] insisted that the Louisiana Highway Department perform such services.

"As far as we know, not one contract of consequence has been awarded to a Louisiana consulting engineer in more than one year. Correct us if we are in error."

The state society requested the Administrator to advise "why the Bureau of Public Roads refused to approve the use of consulting engineers for designing the high level bridge" over the Industrial Canal at New Orleans on the multilaned Interstate route.

The "Power Grab"

There is skepticism in Congress, even among some of the staunchest advocates of expanded public power, over charges that the investor-owned power companies are "spending in excess of $20 million to grab control of a billion-dollar taxpayer investment."

The "grab control" charge was made by John M. Bailey of Connecticut, chairman of the Democratic National Committee, in a signed article printed in the Democratic party's official party publication. Bailey called for an investigation by Congress and the Federal Power Commission.

Bailey charged that the consumer is paying for what he called "an expensive lobby operation to block construction of Federal transmission lines from the Colorado River storage project." He further charged that the power companies want to be the middle man and profiteer between Federal power generating facilities and nonprofit distributors. However, one Democratic member of Congress said: "I doubt if Mr. Bailey could prove his charge. He undoubtedly is trying to make a little political hay, and the investor-owned power companies many times make pretty good targets."

The "Land Grab"

A bill that would take 54 million acres of land in the United States and establish it as a national wilderness preserve is currently pending in Congress – with substantial support. More than 85 percent of the vast acreage lies in the Western states, but all parts of the country are affected. The plan includes 7 million acres of national forest lands, 22 million acres now in national parks, 24 million in wildlife and game preserves, as well as other large tracts.

The wide open space plan sounds all right, particularly in view of the 200 million population figure just ahead, but actually, only a small percentage of the population would be able to take advantage of it.

Udall Admonishes the Engineers

Earlier this year a wiseacre on Capitol Hill cracked that President Eisenhower may have had his U-2 (incident), but President Kennedy has his Udall.

President Kennedy's Secretary of the Interior, Stewart L. Udall, has been a highly controversial figure since taking office. He has been both spanked and commended by the President.

Occasionally, Secretary Udall speaks out with some sound wisdom, particularly on natural resources. In a recent speech to Western Land Commissioners, he pointed out that we face a double problem in this country today. On the one hand, there is the mounting pressure of population, with increasing demands for space, water, and resources. On the other hand, Udall emphasized, we are faced with the inescapable fact that there are fixed limits to our natural resources.

The Secretary said it is inevitable that we will continue enlarging the man-shaped part of the landscape. Therefore, he appealed to the public planners

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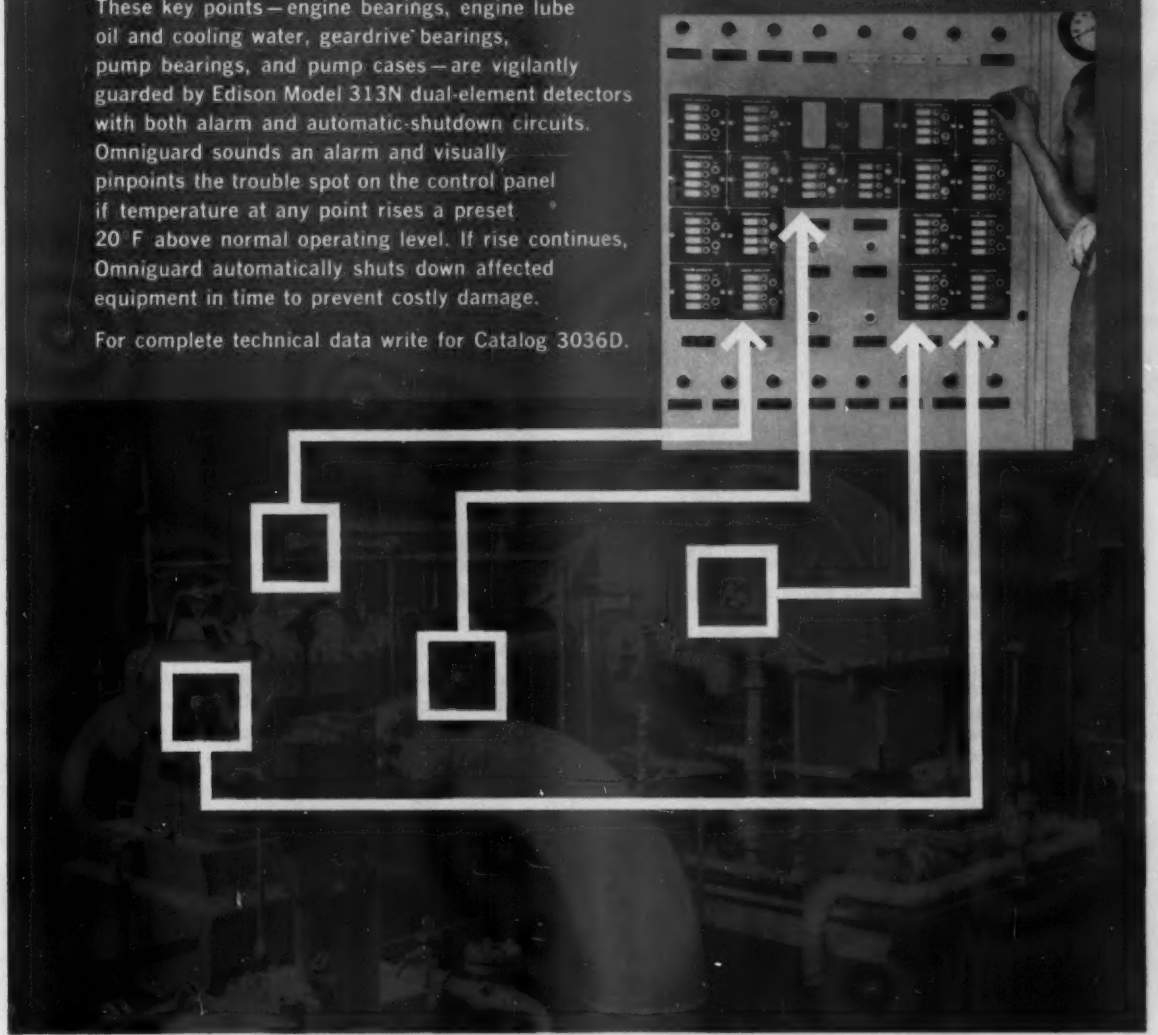

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and consulting engineers to be on the scene ahead of the bulldozers. Land use and land conservation are growing more and more important.

Federal Employee Expense Accounts

Engineers and other employees of the United States government, who are required to travel in connection with their services and employment, are getting an expense break. President Kennedy has signed into law a bill which raises the normal maximum expense allowance from $12 to $16 a day, and the official maximum from $25 to $30. The "official maximum" applies to government representatives who are required to stop at swank resort hotels. Those who travel overseas will be allowed actual expenses up to $26 a day. Mileage for use of private automobiles has been increased from 10 cents to 12 cents a mile.

Depressed Area Program

Capabilities of seven Federal agencies are being pooled to carry out the government's new $394 million program to aid areas suffering from substantial and persistent unemployment and underdevelopment. The agencies involved, in addition to the Area Redevelopment Administration, headed by William L. Batt, Jr., are the Departments of Agriculture; Interior; Labor; and Health, Education, and Welfare; the Small Business Administration; and the Housing and Home Finance Agency.

Roles which the various agencies will play are spelled out by the Secretary in a memorandum delegating authority under the Area Redevelopment Act. Inclusion of the other Federal agencies in the over-all program reflects the intent of Congress to utilize the resources of the Federal government to the maximum extent and to avoid duplication of facilities.

Over-all supervision and coordination of the new government program will remain the responsibility of ARA. It will have representatives in the states, working closely with state development agencies, to assist communities in making the best possible use of the facilities offered by the participating agencies. Three of the agencies involved – Labor, HEW, and HHFA – all have specific statutory authority for key phases of the depressed areas program.

Feedback from CEC Testimony

Representative F. Edward Hebert, chairman of the House Armed Services Investigating subcommittee, declares that he concurs with the Consulting Engineers Council, at least in part.

The Consulting Engineers Council presented a statement (see page 91) to the Herbert Committee in connection with its "contracting out" policy involving private or public engineering. CEC said it believes that the question of whether public staffs or private consulting firms should design and supervise con-

NEW SARAN LINED DRAIN LINE—won't break or rust out, installs fast with regular plumbers' tools!

This new corrosion-resistant plumbing is handled like ordinary pipe. Install it in ordinary wall sections . . . use regular plumbers' tools and methods . . . and don't baby it. And where space is tight, design of fittings permits use of spanner or strap wrench. Saran lined drain line and fittings *won't break* when you install them, and they stand up to almost *anything* a man might put in them . . . acids, alkalis, radioactive wastes. They won't rust out even after years of service!

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REPRESENTATIVES WORLD WIDE

struction on public projects should be resolved by a single criterion: What approach will serve the taxpayers' interest best?

The Council advised Congress that it is convinced that the private practitioner has unquestionably demonstrated his ability to save the taxpayer money on public projects through efficient design, expeditious services, and reasonable fees.

Representative Hebert, a Louisianan who regards himself as a conservative, told CONSULTING ENGINEER's correspondent that he would favor private consultants over government consultants, if it can be proved private consultants can do a job cheaper. "When I say cheaper," said the tall Southerner of French descent, "I do not necessarily mean dollars – I mean from the standpoint of efficiency and production.

"Contracting out is not a black and white proposition. It is a difficult area – a gray area. What may at first blush appear to be economy by contracting out could well be extravagant on reexamination. What at first may seem more economical by government performance could well be waste in the ultimate. Each situation must be examined in this light.

"There is no positive answer."

The Congressman said that the committee hearings and recommendations will not be published until sometime in the early fall.

NSPE vs C of C?

The National Society of Professional Engineers and the United States Chamber of Commerce have taken opposite viewpoints in connection with the administration's proposed legislation to establish a water resources council composed of four cabinet officers.

NSPE endorsed the plan for a series of reasons, including the asserted need to improve coordination between the Federal agencies and the agencies of the state and local governments. NSPE's statement was expressed to the Senate Interior and Insular Affairs Committee through Charles D. Curran, an engineer and member of the group's committee on Federal engineering and scientific activities.

The United States Chamber of Commerce maintains that the legislation would tend to nationalize all water resources planning and development. Furthermore, the Chamber insists, the proposal would downgrade the role of state and local governments and private industries, and would fail either to recognize or to protect existing river basin development compacts adopted by state legislatures.

Hydraulic Mining for Coal

A major research project, to determine whether coal in the State of Washington can be mined with powerfull jets of water, will be undertaken as a joint venture of the Bureau of Mines and the Northern Pacific Railway Company. An agreement has been signed

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Here's What — Silicone insulated dry-type transformers in three enclosures: (1) open, (2) enclosed and (3) gas-filled sealed.

Here's Where — For power station auxiliaries, a choice of enclosed, open or sealed gas-filled dry-type transformers — and, for underground distribution systems, sealed gas-filled dry-type transformers.

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between the Bureau and the railroad for conducting the experiments in the company's mine at Roslyn, Washington, about 70 miles east of Seattle.

Hydraulic mining is sought as the answer to difficult problems in producing coal from "steeply pitching" beds encountered in the Roslyn mine and other mines in Washington, said Bureau Director Marling J. Ankeyn. He added, "It is our hope that water jets can succeed where the use of modern mining machinery is not possible."

A New Chance for Creative Design?

The Federal National Mortgage Association (FNMA) has opened up new opportunities for creative engineering design. It has established a special assistance program to purchase insured mortgages on homes or multifamily housing structures incorporating new and untried materials, design, and construction methods.

Caribbean Power via World Bank

A loan equivalent to $23.5 million has been made to the Territory of Trinidad and Tobago for electric power development. The loan was made by the World Bank, with the participation of private investors. It will help to finance the construction of a 100,000-kw thermal power plant at the capital, Port-of-Spain; the construction of a 41-mile natural gas pipeline to supply fuel for the plant; and the expansion of transmission and distribution facilities. The additional power should meet the territory's requirements for several years, and the capacity of the pipeline should be sufficient to supply the power plants in the Port-of-Spain area for the next 20 years.

The islands of Trinidad and Tobago constitute a British territory in the Caribbean. The territory has just been granted full internal self-government and is a constituent part of the West Indies Federation which is expected to become independent on May 31, 1962. This is one of the most prosperous areas in Central and South America and its people enjoy a relatively high standard of living.

The new project will be operated by the Trinidad and Tobago Electricity Commission, now the sole public power authority in the territory. The Commission's existing power plants at Port-of-Spain and at Penal, 45 miles to the south, have an installed capacity of 80,000 kilowatts. This will be increased to 100,000 kilowatts when a new unit at Penal, due for completion by the end of 1961, is commissioned. The thermal power plant now to be built at Port-of-Spain will have an initial capacity of 100,000 kilowatts, but will be designed for capacity of 220,000 kilowatts.

Nuclear Power at Sea

Army engineers have ordered into production a floating nuclear power plant. The plant, to be designed and built by the Martin Company, of Baltimore, Maryland, under a $17 million contract, will be housed in a reconditioned Liberty ship, the *Walter F. Perry*.

The project is in keeping with the current emphasis on high military mobility. The plant will be able to supply enough power to furnish the electrical needs of a community of 20,000. The atomic barge may be floated from place to place as needed, whenever normal supplies are cut off by peacetime disaster or wartime action.

The reactor planned by Martin is a pressurized water system, using the same basic techniques which have proved successful and reliable in a number of stationary atomic plants. Water passing under pressure through the hot core of the reactor transfers the heat to water at low pressure, and the steam which is produced turns the blades of a turbine.

Reclamation Rewards Authors

A technical book, *Design of Small Dams*, designed as a reference and guide for engineers in both private and government service, continues to receive recognition. A $5000 group award for outstanding achievement in the writing and publication of the book was dispatched to 22 Bureau of Reclamation employees and divided on a proportionate basis.

Coordinator and editor of the book was H. G. Arthur, assistant regional director in Billings, Montana, who was previously supervisor of the design unit in the earth dams section of the Bureau of Reclamation.

The book, published last year, is being translated into Spanish and Japanese. ▲▲

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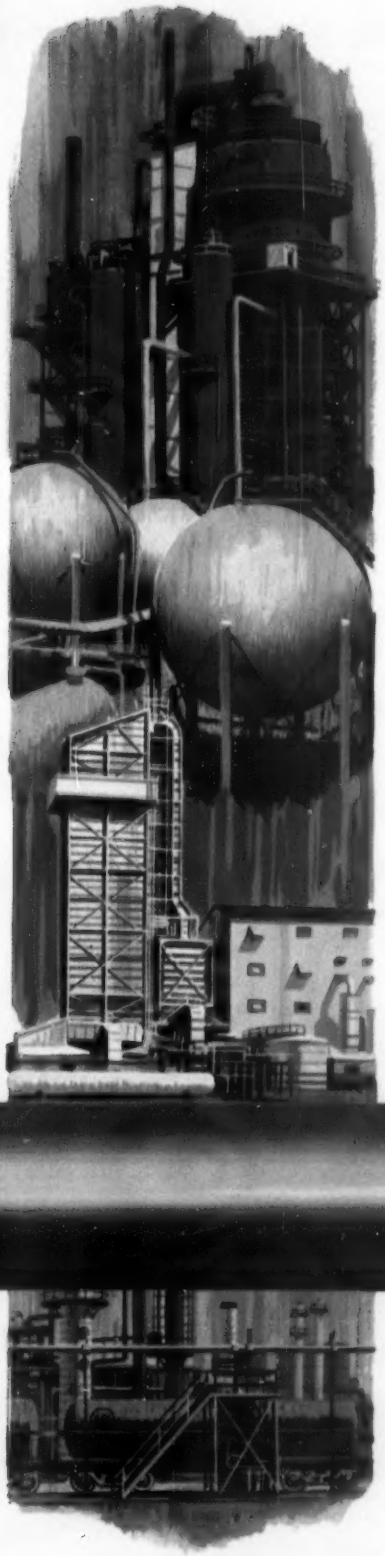

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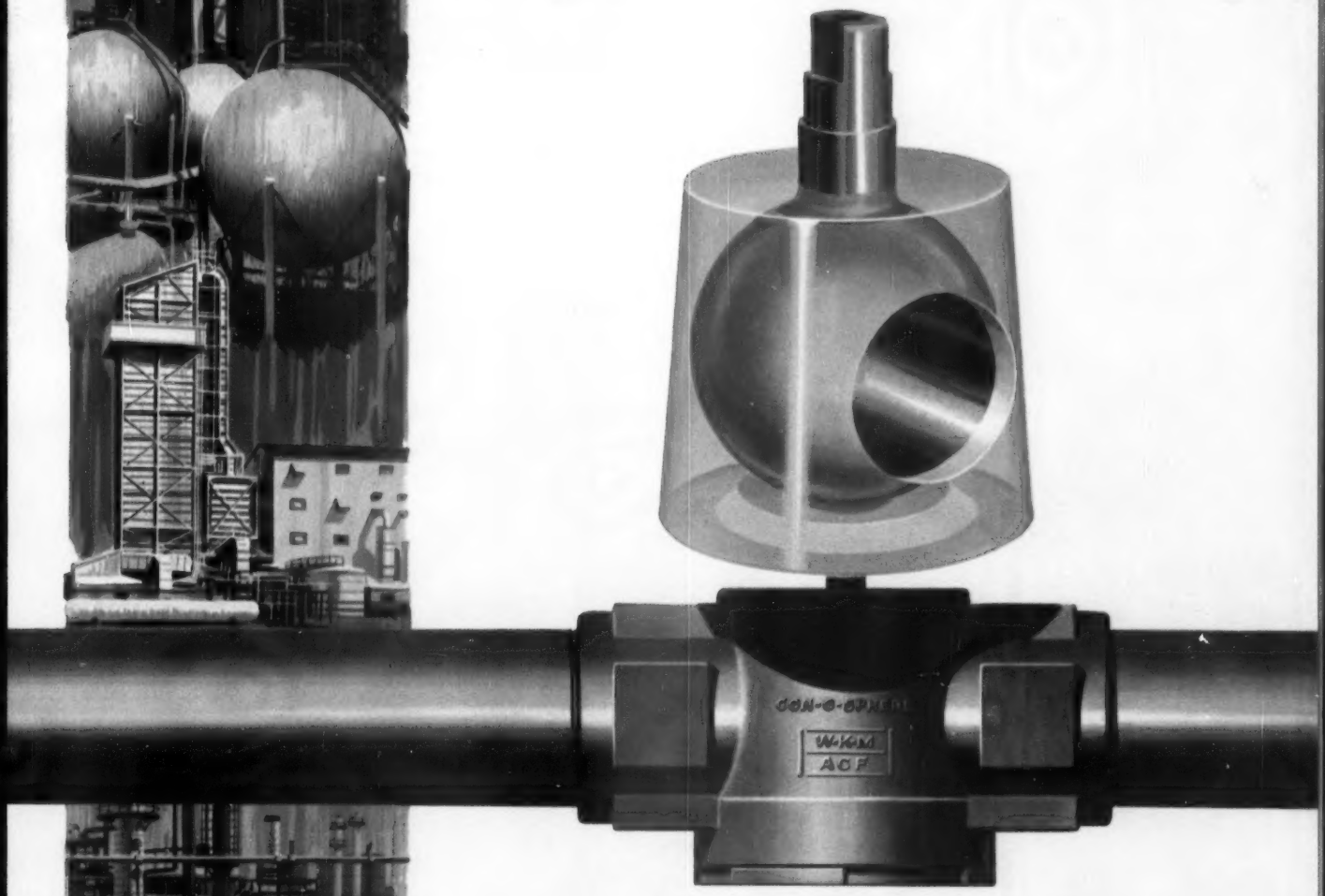

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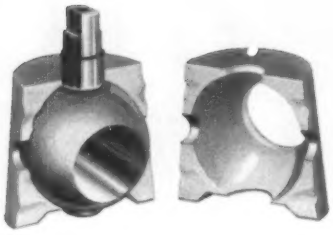

This revolutionary sealing capsule consists of a polished metal ball molded permanently within a solid block of Teflon. Because of the natural slipperiness and resiliency of Teflon, the confined ball turns easily and smoothly although there is no clearance between the ball and the Teflon. The surface of the ball provides a positive seal against the inner surface of the Teflon, thus giving the maximum possible sealing area. When the cone-shaped sealing capsule is placed into its mating cavity in the valve body, and forced into position tightly by means of the screw-in base plate, the outside surface of the Teflon provides a seal with the smoothly finished metal of the body. Result—a valve having the maximum sealing ability ever achieved!

ON-FLOW SEAL ADJUSTMENT is easily accomplished by tightening the base which forces the resilient Teflon sealing capsule to fill the body cavity to prevent any leak-through, and also forces the Teflon into more intimate contact with the ball. The same adjustment likewise provides a tighter stem seal by forcing the Teflon stem seal gasket tightly against the top of the body. Thus tightening the base plate, which can be done while the valve is in service, makes possible complete adjustment of all sealing surfaces.

PLUG-IN REPLACEMENT OF THE SEALING CAPSULE, if ever necessary, takes but a few minutes, permitting the fastest and most economical ball valve overhaul on record. The Con-O-Sphere is ideal for use as a panel mounted instrument valve. They are easily adjusted or repaired without removing from the panel and are drilled and tapped for easy mounting.

STEM SEAL
A pressure actuated Teflon gasket for extra protection against stem leakage.

REMOVABLE HANDLE
Light weight aluminum alloy designed for easy operation.

SEALING CAPSULE
The Teflon is permanently molded about the polished metal ball with integral stem.

BASE PLATE
Provides easy on-flow adjustment of both line and stem seals. Quickly removed for fast plug-in replacement of Sealing Capsule and stem seal.

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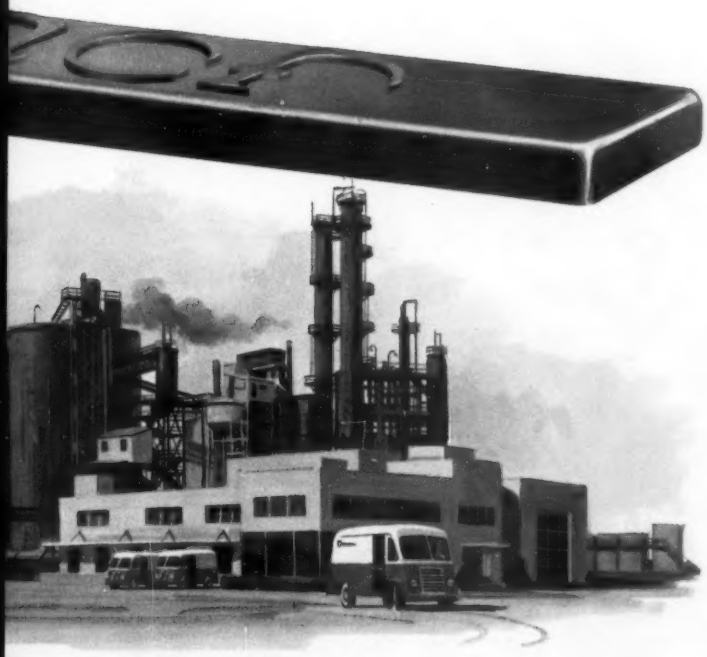
UNEQUALLED VERSATILITY. The Con-O-Sphere is available in ductile iron, steel, aluminum, stainless steel and bronze and consequently is adaptable to an extremely wide range of applications. The working pressure range from vacuum to 1440 psi, and size range from ⅛″ through 2″ make it applicable to a large percentage of process plant small valve needs. It operates efficiently over a wide temperature range.



VALVE BODY
Screwed, flanged or as otherwise specified. Standard Materials are ductile iron, carbon steel, stainless steel, aluminum and bronze.

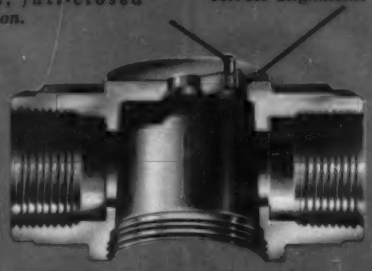
THE CON-O-SPHERE BALL VALVE is ideal for such difficult services as handling acetone, aviation fuel, naphtha and coal tar solvents, lime and soda ash slurry, helium, chlorinated solvents, liquid butadiene, and riboflavin. It finds applications in all process plants where efficient handling of gases, liquids, and viscous or abrasive ladings is vital. It is ideal for welding in the line because the Teflon sealing capsule is so easy to remove and replace. The complete range of sizes and pressures is charted on the back page of this folder.

HANDLE

HANDLE SET SCREW

HANDLE STOP
Locates ball in full-open, full-closed position.

LOCATING PIN
Holds the sealing capsule stationary and in correct alignment.

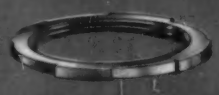


BODY WITH LOCATING PIN

TEFLON* STEM SEAL

UNITIZED TEFLON-AND-BALL SEALING CAPSULE

BASE PLATE

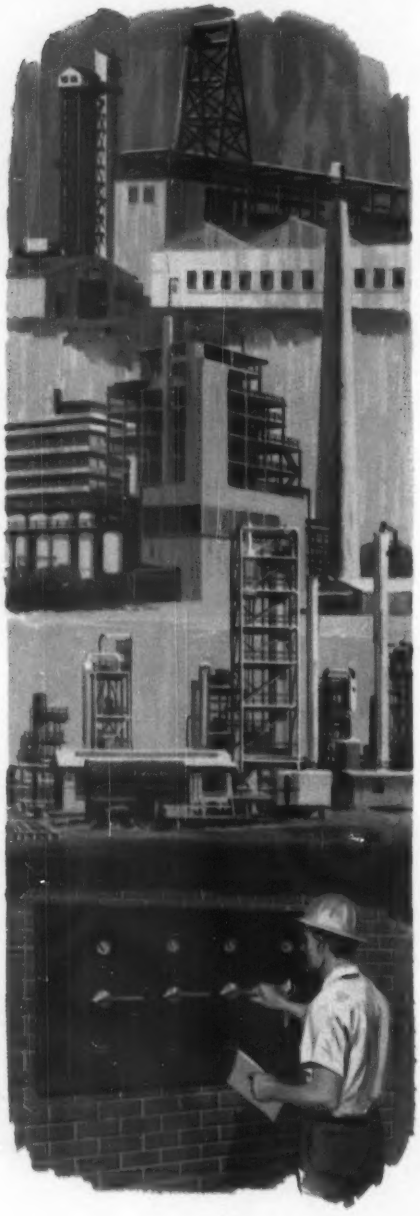


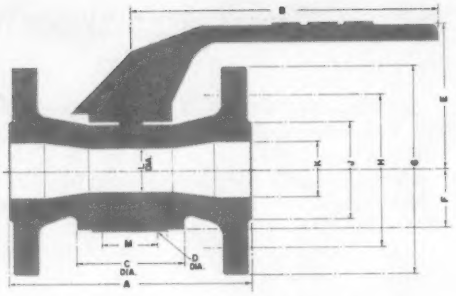
LOCK NUT

This unique ball valve consists of only a handful of parts. Such a simple, basic design makes for long life and efficient trouble-free operation. First cost is low and maintenance is practically negligible. The entire valve may be disassembled and reassembled in just a few minutes, on or off the line.

*Du Pont's Tetrafluorethylene resin

CON-O-SPHERE BALL VALVE



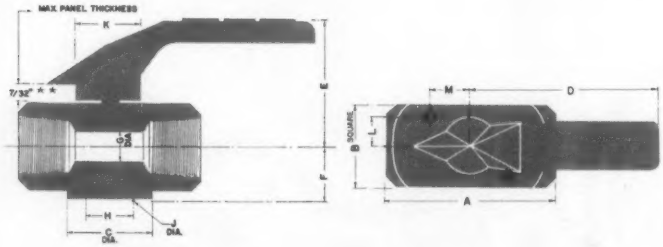


Size Flange	A	B	C	D**	E	F	G	H	J	K	L	M	N*
½" —150#	4¼	3½	1¼	3/16	2½	25/32	3½	2⅜	1⅜	⅝	7/16	⅝	4-½
¾" —150#	4⅝	6½	1 11/16	3/16	2¾	31/32	3⅞	2¾	1 11/16	13/16	⅝	⅞	4-½
1" —150#	5	6½	2¼	¼	2 23/32	1⅜	4¼	3⅛	2	1 1/16	13/16	1	4-½
1¼" —150#	5½	6½	2½	¼	3 1/32	1⅝	4⅝	3½	2½	1¼	1	1¼	4-½
1½" —150#	6½	10	3	5/16	4 3/16	1⅝	5	3⅞	2⅞	1⅝	1¼	1½	4-½
2" —150#	7	10	3½	5/16	4 3/16	1 13/16	6	4¾	3⅝	2 1/16	1½	2	4-⅝

*N = NUMBER AND SIZE OF FLANGE BOLTS **D = DIA. OF SPANNER WRENCH HOLES

Size Flange	A*	B	C	D	E	F	G	H	J	K	L	M	N*
½" —300#	4¼	3½	1¼	3/16	2½	25/32	3¾	2⅝	1⅜	⅝	7/16	⅝	4-½
¾" —300#	4⅝	6½	1 11/16	3/16	2¾	31/32	4⅝	3¼	1 11/16	13/16	⅝	⅞	4-⅝
1" —300#	5	6½	2¼	¼	2 23/32	1⅜	4⅞	3½	2	1 1/16	13/16	1	4-⅝
1¼" —300#	5½	6½	2½	¼	3 1/32	1⅝	5¼	3⅞	2½	1¼	1	1¼	4-⅝
1½" —300#	6½	10	3	5/16	4 3/16	1⅝	6⅛	4½	2⅞	1⅝	1¼	1½	4-¾
2" —300#	7	10	3½	5/16	4 3/16	1 13/16	6½	5	3⅝	2 1/16	1½	2	4-⅝

*ASA 150# FACE TO FACE (ASA 300# FACE TO FACE AVAILABLE ON REQUEST)



Size	A	B	C	D	E	F	G	H	J*	K	L	M
⅛ NPT	2	1	1	3	1¾	11/16	3/16	3/8	⅛	7/16	3/16	5/16
¼ NPT	2	1¼	1¼	3	1 13/16	13/16	7/16	5/8	3/16	7/16	7/16	5/16
⅜ NPT	2 5/16	1¼	1¼	3	1 13/16	13/16	7/16	5/8	3/16	7/16	7/16	5/16
½ NPT	2 11/16	1¼	1¼	3	1 13/16	13/16	7/16	5/8	3/16	7/16	7/16	5/16
¾ NPT	3⅛	1⅝	1 11/16	6½	2 13/16	1	5/8	7/8	3/16	1 5/16	21/32	1⅛

*J = DIA. OF SPANNER WRENCH HOLES **⅛ NPT THROUGH ¾" NPT ONLY

Size	A	B	C	D	E	F	G	H	J*
1 NPT	3⅞	1⅝	2 5/16	6½	2 15/16	1⅜	1 3/16	1	¼
1¼ NPT	4 11/32	2	2½	6½	3 1/16	1⅜	1	1¼	¼
1½ NPT	4¾	2 5/16	3	10	4 1/16	1⅜	1¼	1½	5/16
2 NPT	5⅜	2¾	3½	10	4 5/16	1 13/16	1½	2	5/16

VALVES LARGER THAN ¾" DO NOT HAVE PANEL MOUNTING HOLES

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In Preparation

THE CONSULTING ENGINEER SPECIFICATION DATA FILE

A new service for readers of CONSULTING ENGINEER *Magazine*

For issuance early in 1962, the publishers of CONSULTING ENGINEER are preparing a new annual Data File service *exclusively for the use of consulting engineers in private practice.*

The complete File will be furnished without charge to every private-practice consulting engineering firm on our list of more than 6,000 firms.

Announcement of the service, with an invitation to participate, has been made to more than 1,000 U.S. manufacturers of equipment, products and materials specified by consulting engineers for their clients' projects.

Created for YOUR Special Needs

The new service will place at your finger-tips manufacturers' product information on everything from foundation and building materials to power plant equipment, from air conditioning to waste disposal, from lighting to highways and bridge materials. Mechanical, electrical, structural, process, chemical products will be included —all conveniently indexed for quick access.

> To assist in assuring that the included material is suited to the special needs of consulting engineers, manufacturers have been advised that we have retained a special Screening Board composed of consulting engineers, to examine and report upon the completeness and clarity of information offered for inclusion in the File.

Importance of the Profession Recognized

The consulting engineering profession, playing today's major role in the specification of manufacturers' products in construction and industry, has been too often mistakenly treated as a stepchild or country cousin. The new CE SPECIFICATION DATA FILE, organized for consulting engineers and no one else, will for the first time provide a service tailor-made for YOUR needs.

Several catalog file services are available and now used in a few consulting engineering offices *but not one of these is designed specifically for you.* All are created for distribution to mixed groups such as contractors, architects, plant engineers, municipal and government engineers, sales engineers, etc.

Watch the pages of this magazine for more information as preparation of the new service progresses.

THE CONSULTING ENGINEER SPECIFICATION DATA FILE
by the publishers of
CONSULTING ENGINEER Magazine

From the Editor's

Tranquil Tower

The Fight for Private Practice

CONSULTING ENGINEER believes that the government should get out of the practice of engineering – particularly engineering design. As a matter of principle, we believe that goods and services should be provided for the American public from the private sector of our economy. Unfortunately, there are those both in and out of government who believe otherwise. As a result, government is steadily increasing its activities in the services area. Before this becomes a matter of long term policy, an informed public must decide whether this is what it wants.

Though we may question their semantics, we are heartily in accord with the consulting engineers' battle against "socialized engineering." Provided, of course, that the battle is being fought on principle rather than as a matter of self preservation.

For the consulting engineer, the fight will be a difficult one – mainly because too few people know who and what consulting engineers are. We still believe that the profession has failed to do a proper job of making itself known. But now, a new factor has been introduced.

The construction industry, in activities at home and abroad, has been beset by scandal. Unfortunately, consulting engineers are not emerging from the ensuing investigations unscathed. Instead of remaining lily-white, the profession has taken on a tone of tattle-tale-gray. It could not be otherwise, but the timing is most unfortunate.

While engineers in private practice have shown as great a devotion to the public health, safety, and welfare as their fellow professionals in medicine and law, this is not enough. They must show even greater devotion if they want to survive, for engineering services are being provided by government to a greater degree than are any other professional services. The ethics of private practice must be clearly superior to the ethics of government practice.

By the same token, the technical competence of engineers in private practice must be beyond question. To err is human, to forgive divine – and the daily press will leave it at that. The surest way for a consulting engineer to get his name in the paper is to turn out a faulty design. The press is all too familiar with immorality, and is sometimes even sympathetic. But so great is its faith in engineering that it will not tolerate the slightest miscalculation.

Thus, it behooves the American Institute of Consulting Engineers, the Consulting Engineers Council, and the Functional Sections for Consulting Engineers of the National Society of Professional Engineers to set their own houses in order before they go out to slay the dragon of "socialized engineering." Do their membership requirements bar the incompetent? The unethical? Have they devoted sufficient effort to the development of minimum standards of performance and made these standards generally available? Have they dared to run the rascals out of their own ranks?

We submit that it is not enough for these questions to be answered in the affirmative within the confines of these organizations. We submit that they must be answered in public – and answered before they are asked. When this has been done to everyone's satisfaction, the consulting engineering profession will be ready to take on the task of getting the government out of engineering.

Meanwhile, the battle lines are drawn. It will be a rough fight, as the special section on Government in Engineering in this issue of CONSULTING ENGINEER points out. But government policy regarding engineering services has not yet firmed up. It is still a matter of individual opinion. Consulting engineers will find many strange allies, and even stranger enemies. They will have to choose them with care – on principle rather than on expedience. ▲▲

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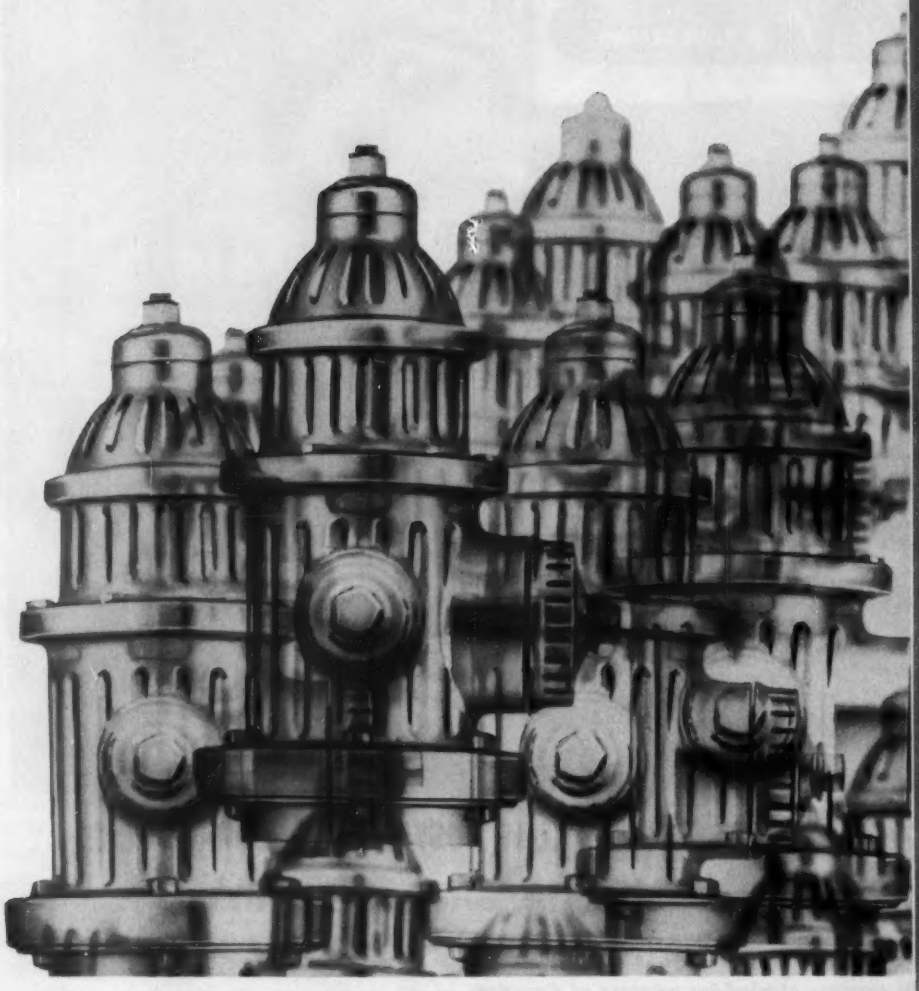

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Electri-Cand pumps handle practically *any* solids-free solution: precious liquids, corrosives, toxic fluids, volatile compounds. As for safety . . . *Electri-Cand* pumps rated up to 91 psi are UL approved for Class I, Group D hazardous locations — nearly twice the approved rating of any other "canned" pump.

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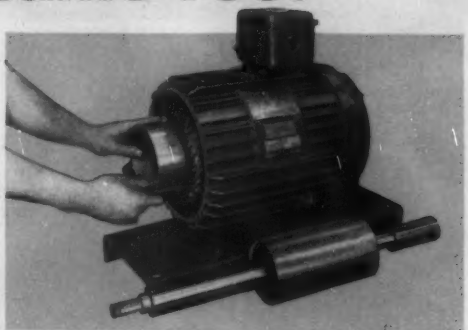

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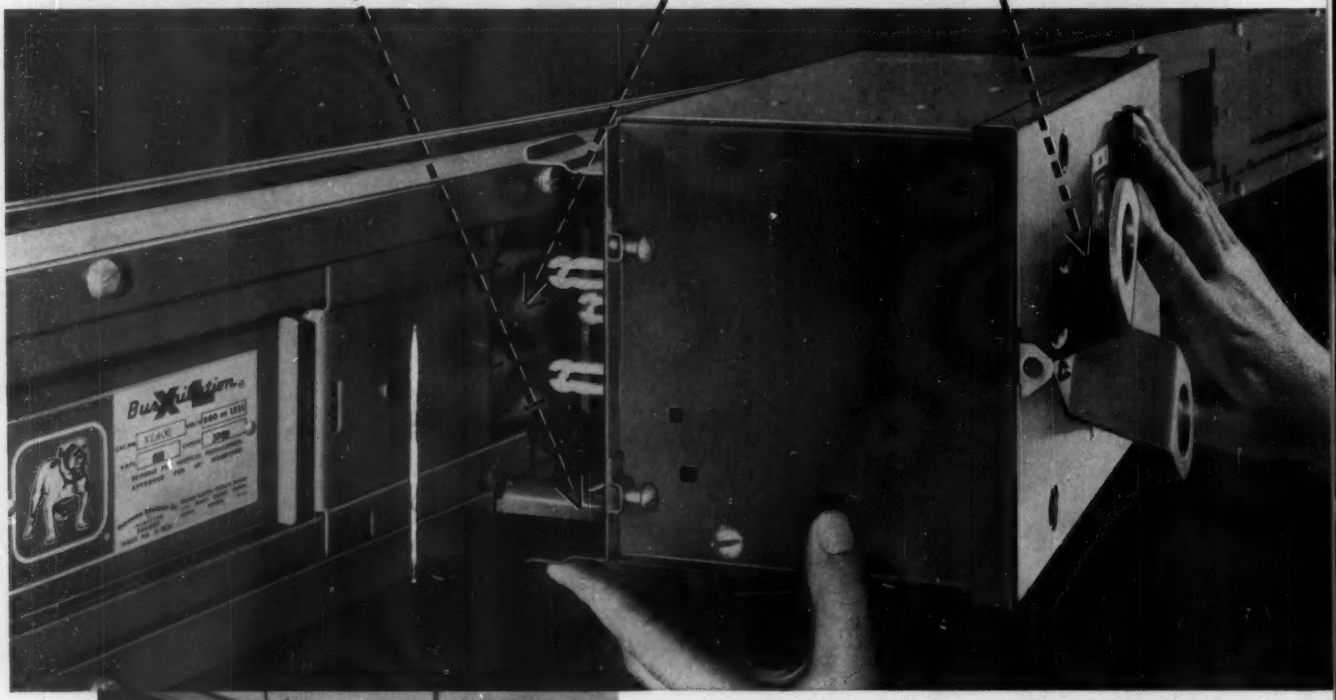
3 Safer because there's no arcing to endanger personnel or equipment. The XL Safety Plug *must* be in the "OFF" position before it can be inserted or before it can be removed.



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BULLDOG ELECTRIC PRODUCTS DIVISION

Heard Around Headquarters

MARJORIE ODEN,

Eastern Editor

New Functional Section

The Pennsylvania Society of Professional Engineers has voted to form a functional section for engineers in private practice. The original meeting, in connection with the Pennsylvania Society convention, had 30 persons attending. The Pennsylvania Functional Section makes a total of 28 for consulting engineers in the National Society of Professional Engineers.

Consultants Exempt

Illinois Department of Revenue officials have stated that consulting engineers do not have to pay a tax levy on their services.

Recently, the Illinois Service Occupation Tax was broadened to the extent that dentists must pay tax on materials used in fillings, contractors must pay a tax on items such as bathtubs placed in houses, and pharmacists must pay a tax on prescription ingredients.

As the Illinois Association of Consulting Engineers pointed out, "That will be the day! . . . with fees for professional service taxed alongside cement and popcorn and levied against doctors, lawyers, engineers, and other hitherto 'untouched' practitioners.

"Right now every consultant is pretty well bitten tax-wise and he pays right through the nose on scores of items used in his business. He pays a lot of taxes right out in the open and many others in the 'hidden' category which end up in the long run for the 'privilege' of practicing his profession."

NCSBEE Meeting

At the meeting of the National Council of State Boards of Engineering Examiners in Biloxi, Mississippi, questions on the Model Law were sent to a new standing committee and NCSBEE voted against the proposed merger of Engineers Joint Council and the Engineers Council for Professional Development.

This leaves both matters somewhat up in the air.

Since the adoption of the revised Model Law about one year ago, the corporate practice provisions have been the source of considerable disagreement. Primary action taken by NCSBEE was to appoint a committee for Model Law review. Prior to this action, the Model Law came up for review only every five years. The new committee has the power to propose revisions each year if the occasion arises.

The vote against the EJC-ECPD merger means the entire merger is in doubt. A two-thirds majority of ECPD members is needed for the merger to become effective. So far, favoring the merger are the American Society for Engineering Education; the American Institute of Mining, Metallurgical, and Petroleum Engineers; the Engineering Institute of Canada; and the American Institute of Chemical Engineers. Opposed, in addition to NCSBEE, are the American Society of Mechanical Engineers and the American Institute of Electrical Engineers. The two new members of ECPD (the Institute of Radio Engineers and the Institute of Aerospace Sciences) both must approve in order for the merger to go through.

The Committee on Engineering Laws, which is composed of firms with a mutual interest in corporate practice, was denied NCSBEE membership.

No action was taken on the registration of planners who are neither architects or engineers, or on the registration of engineering technicians as proposed by NSPE.

People to People

Robert B. Lea, retired engineering executive from Sperry Rand, told the American Institute of Consulting Engineers recently of the "Engineers and Scientists People to People Program" organized to help

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Entire motor-and-fan housing may be flipped back 90° to make motor, drive assembly and fan conveniently accessible above roof level. Such easy access to all working parts for quick inspection cuts maintenance costs substantially by saving time and making the work easier.

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Write for illustrated Bulletin DR-7-61

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engineering colleges, throughout underdeveloped countries of the world, to build libraries.

Lea, working with the committee and other retired engineers and with voluntary helpers from the Boy Scouts, is collecting used technical magazines and engineering books to distribute to foreign universities and technical schools.

"The American engineers could be of immense assistance to the faculty and students by sending us their magazines and books they no longer need," Lea explained. "I visited engineering schools throughout the Mideast in 1958. In many, I found the students could not afford subscriptions to technical publications, or the books to build proper libraries."

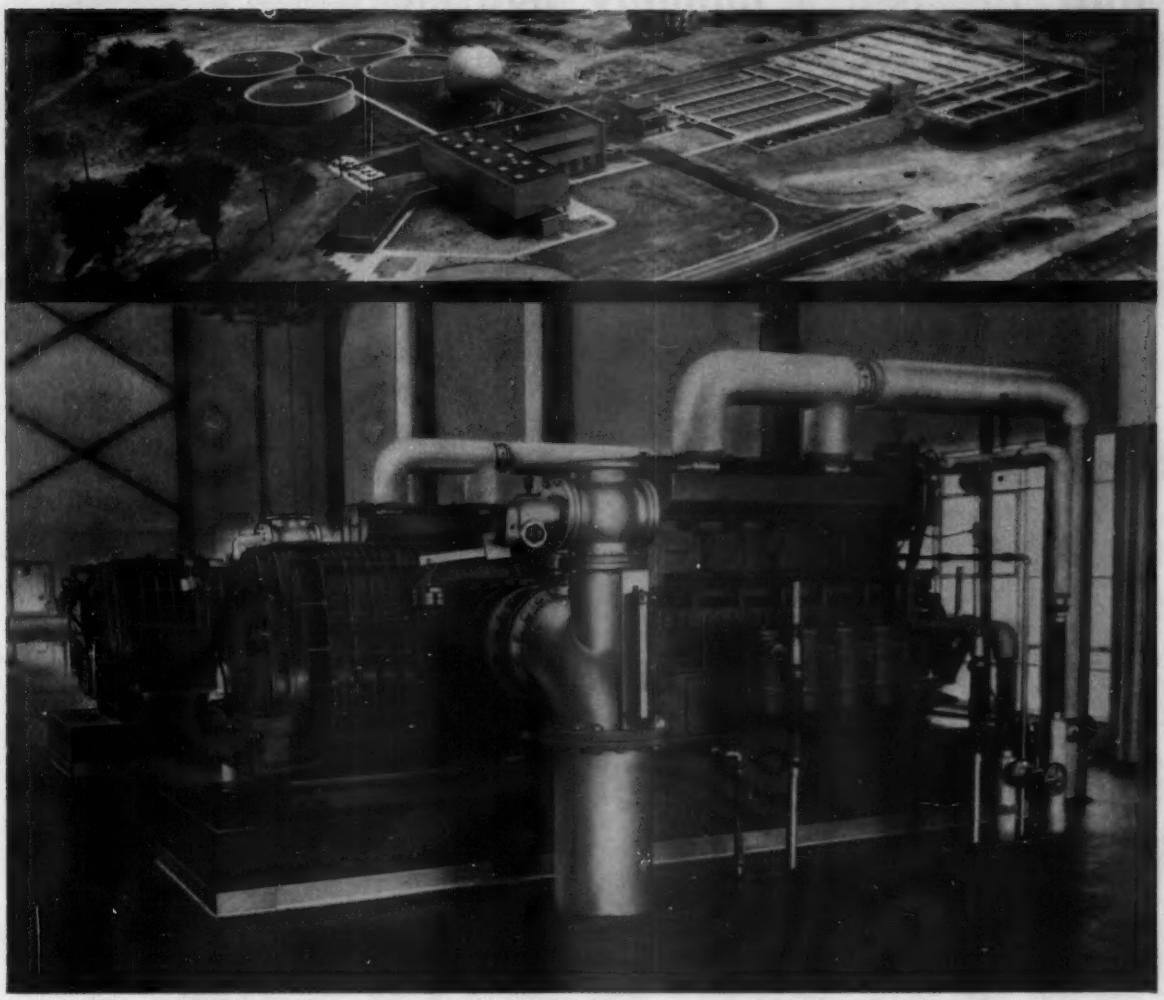
Since English now is the accepted technical language internationally, Lea said language would pose no barrier. The Russians currently are giving technical information — in English — to many of these areas.

Lea, whose group is setting up warehouses in Los Angeles and Detroit in addition to their present headquarters in Long Island City, said technical magazines of all types are particularly needed — with two exceptions. The People to People group is not sending missile and rocket publications "because we do not want to be acused of spreading propaganda," and they also are not handling weekly or semimonthly magazines because of the problem of bulk. Otherwise, "the more technical the material the better."

Any contributions can be sent to 36-02 Northern Boulevard, Long Island City, New York.

Foreign Aid Plans

The American Institute of Consulting Engineers, the American Society of Civil Engineers, the National Society of Professional Engineers, and the District of Columbia Society of Professional Engineers have urged the placement of responsibility for future engineering



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on foreign aid projects with an experienced and qualified engineer.

In recommendations to the President's Task Force for Foreign Assistance, it was pointed out that "In the past 10 years, ICA has spent approximately $60 billion on foreign economic assistance. Of this amount, $20 billion was for some type of engineering and/or construction for a wide range of public works projects . . . Yet, the organizational set-up of ICA neither requires nor currently possesses at a policy making level a man with a professional engineer's training and background." It was pointed out that even contracting procedures for consulting engineers are not handled by a division with an engineer on its top level staff in several ICA branches. "It must be admitted that in many instances, engineering responsibilities and the exercise of engineering judgment have been delegated to and performed by persons having no engineering training or experience."

In his letter to Henry R. Labouisse, director of the Task Force, Gerald T. McCarthy, Institute president, said, "We consider it highly important that your new organization recognize the need for competent professional engineering representation at the top management and direction level, in a post such as Deputy Administrator for Engineering Planning and Design and Technical Supervision of Construction and Operation.

"He should be supported by a special engineering and construction division staffed by experienced professional engineers. This division should be responsible for the selection of consulting engineering firms based on their qualifications, the negotiation of engineering contracts, and their administration."

Soil Conservation Service

C. J. Francis, director of engineering for the Soil Conservation Service, expects increased watershed protection and flood prevention projects to be budgeted in the

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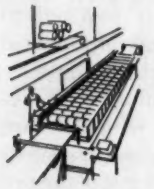

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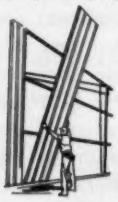

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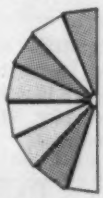
BUTLER MONOPANL.® A beautiful, three-ply, factory-finished, factory-insulated wall panel. Outside, bold, vertical fluting imparts strong shadow lines. Inside surface is smooth. No visible exterior fasteners. No caulking ever.



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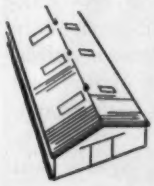

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Do you have any other questions? Phone your Butler Builder for the full story. He's listed in the Yellow Pages under "Buildings" or "Steel Buildings." Or write direct.

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future, and as a result is increasing his staff as rapidly as possible. However, he still favors the use of consulting engineers for specialized design problems and for some peak load situations:

"First, let me explain our department's policies on engineering," Francis said. "The Soil Conservation Service, in some instances, will provide surveys, site investigations, layout, design, and preparation of specifications for structures on privately owned land, if the structures are for flood prevention and agricultural water management. We also will supervise construction. This help is given except where a local organization is required to obtain a non-Federal professional engineer, or has elected to do so.

"The local organization is required to provide, without reimbursement, professional engineers for the planning and installation of structures for purposes other than flood prevention, agricultural water management, and fish and wild life development. These engineers must be approved by the Secretary of Agriculture.

"The local organization has the option of using non-Federal professional engineers or Soil Conservation Service engineers in installing structures for flood prevention, agricultural water management, and fish and wild life development. If the local organization uses non-Federal engineers satisfactory to the Secretary, it may be reimbursed by the Federal government for the cost of such service. The Secretary of Agriculture may advance to the local organization up to 5 percent of the total cost of the structures for the engineering services."

Last year, Francis' agency was responsible for watershed protection and flood prevention projects valued at $20 million. About 16 percent of this was engineering costs, of which approximately $800-000 was in negotiated contracts with consulting engineers. This year, the program is estimated at

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...the most compact units of their type ever offered

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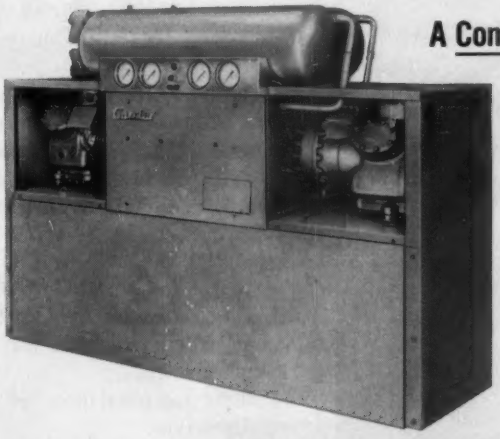
Here's another example of product development by Carrier. Compared with competing models, these new 30HH and HJ Hermetic Reciprocating Liquid Chilling Packages represent a substantial saving to your clients both in floor and area space. They weigh less, too. Equally important, these refinements have been accomplished without cutting back on the efficiency of operation. In fact, capacity has been increased while size and weight have been reduced. They will easily pass through any standard doorway.

Factory-engineered and pre-assembled, 30HH and HJ models arrive at the job site ready to go to work after a few simple water and power connections have been made. Their components are matched to perform efficiently with favorable power consumption; they can therefore offer even lower operating costs than their predecessors at partial loads.

For complete details about the new 30HH and HJ units, call the Carrier dealer listed in the Yellow Pages. Or write Carrier Air Conditioning Company, Syracuse 1, New York.



A Complete Refrigeration System in a Package

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New Carrier 30HH and HJ units consist of a cooler . . . control center which includes all operating controls completely factory-wired and tested . . . auxiliaries to controls . . . hermetically sealed motor compressor . . . and condensers. Both condensers and cooler are manufactured in compliance with the "ASME" Code for Unfired Pressure Vessels and are tested, inspected and stamped accordingly.

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about $50 million, but consultants can expect a somewhat lower percentage of the work.

"There is a definite place for consulting engineers in this growing program," Francis said. "However, a majority of the structures are small and geographically scattered, and for that reason often do not offer much to the consultant in the way of profits.

"Structures range in cost from $20,000 to $200,000, as a rule," Francis added, pointing out that under the watershed program there is a storage capacity limitation of 5000 acre-feet for floodwater detention structures and 25,000 acre-feet of total capacity in structures where the additional storage can serve industries or municipalities.

"Despite the fact that many of our projects are not too interesting or profitable for consultants, we frequently do use consultants on specific foundation investigations, earthfill dams, and on other specialized design projects," Francis added in conclusion.

AIA on Corporate Practice

The American Institute of Architects recently asked a committee to study the advantages and disadvantages of corporate practice and to report back to the Board. The study was completed, included no conclusions, and the subject was closed indefinitely.

According to the committee report, as possible professional advantages to the architect, a corporate type organization:

¶ Provides organizational ties for staff architects, by assigning stock equities to them.

¶ Provides tax advantages in establishing pension and deferred compensation programs for practicing architects.

¶ Permits accumulation of non-taxed reserves.

¶ Provides tax advantages permitting capital gains through stock transfer within the firm.

¶ Permits the predetermination of plans for the continuance or dis-

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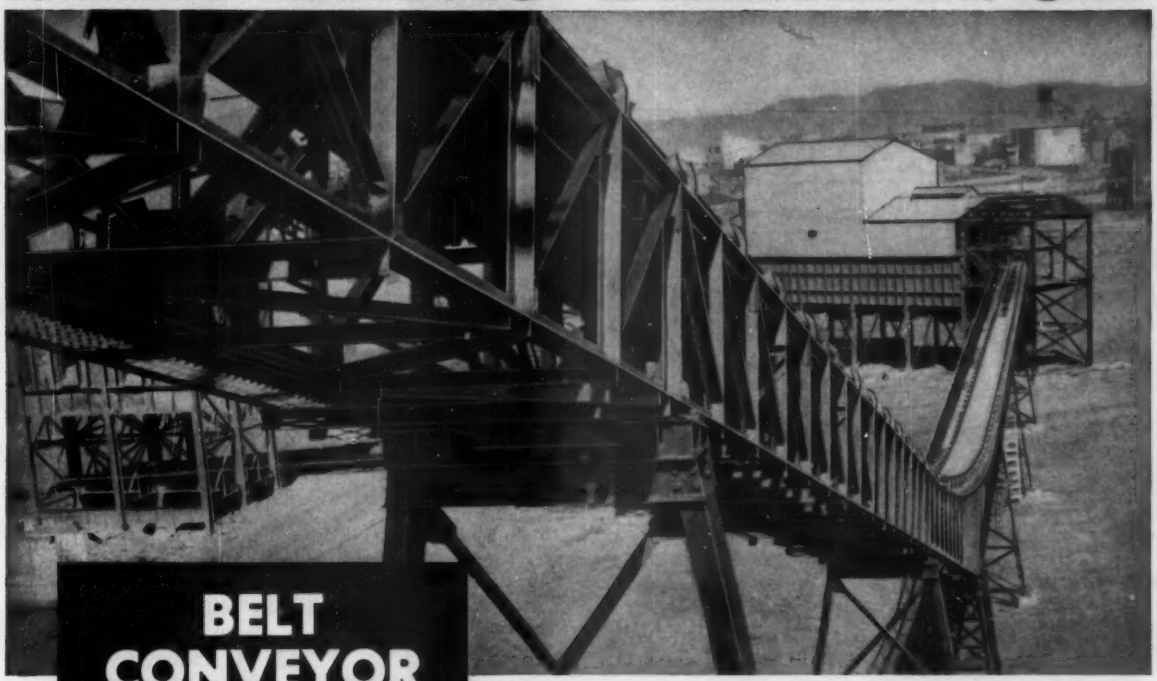

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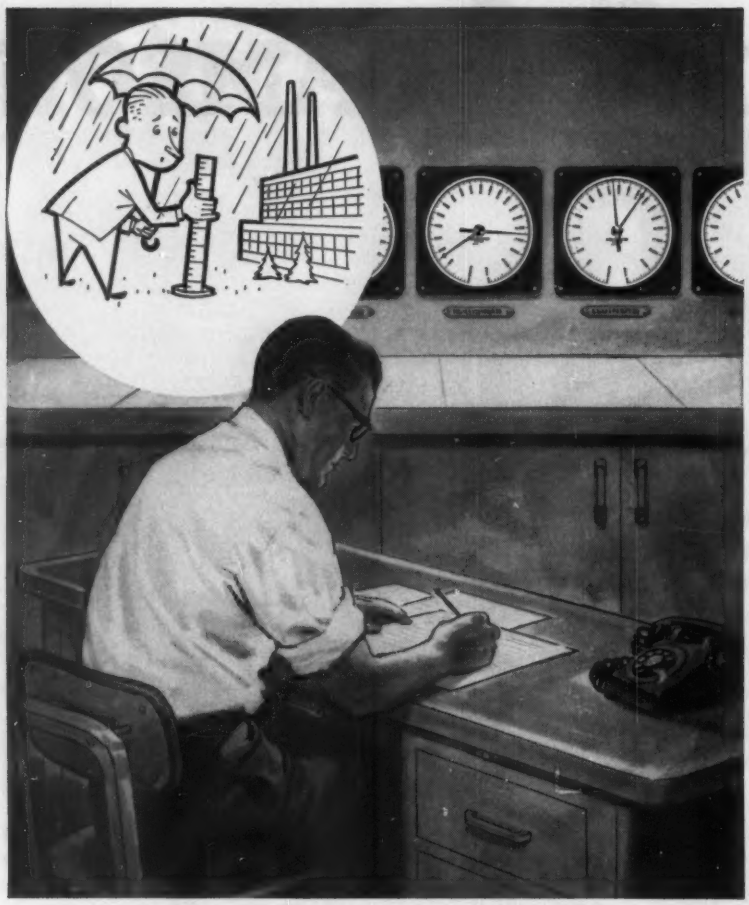

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Here's practical liquid measuring—the modern way... without roaming all over the lot! Liquidometer Gauges let you inventory distantly stored liquids at a glance.

Completely automatic Liquidometer Gauges can be located as far as 250 feet from tanks. Think what this centralized system can mean in man-hours saved—let alone the additional safety of personnel who no longer have to trudge to, or tamper with, hard-to-get-at tanks.

Simple to install, and requiring no maintenance, Liquidometer Gauges measure virtually all liquids conveniently, continuously, and correctly. There's a type available for practically every liquid measuring application.

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position of a firm upon retirement or decease of a principal.

¶ Allows capital to be obtained through the transfer of stock rather than by borrowing.

¶ Establishes a program for the transfer of an interest or of ownership to key personnel.

¶ Allows business expense deductions on insurance and pension plans for principals and employees.

¶ Provides for special tax advantages or continuing income for widows or other dependent survivors.

¶ Reduces some aspects of personal liability and protects non-architectural assets.

¶ Attracts corporate clients, who may favor retaining a professional organization of similar form.

¶ Makes mandatory the keeping of accurate records of transactions.

¶ Encourages efficiency of organization and procedure, with definition of duties and operating responsibilities, thus helping to avoid duplication and conflicts of effort.

Possible disadvantages to an architect incorporating were:

¶ Incorporation can be very expensive because of attorney's fees and costs of filing as required by the state of incorporation.

¶ There is a possibility of double taxation, i.e., personal plus corporate income taxes.

¶ Some states have special taxes and fees which are applicable only to corporations.

¶ Corporations dissolved for unprofessional causes or other legal reasons may reorganize and practice under a new corporate name.

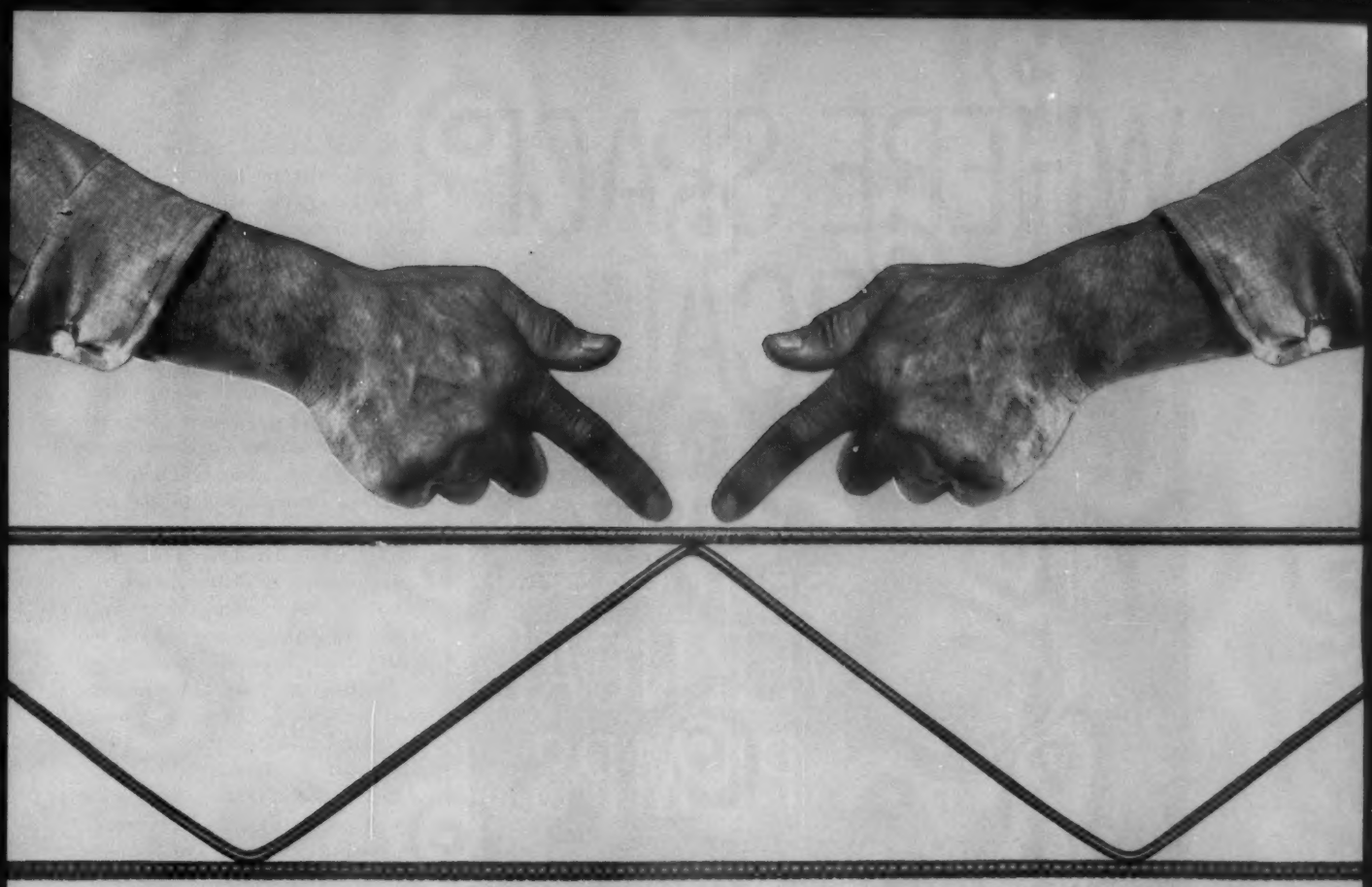
¶ Clients may question the presumed avoidance of personal liability by the architect.

¶ Some public agencies do not permit agreements with corporations for professional services.

¶ A corporation invites lawsuits because of its impersonal nature.

Change in Format

The New York Association of Consulting Engineers, which generally has only business meetings in connection with their luncheons, has



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the masonry wall reinforcement with the trussed design

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Impartial tests have proved that truss-designed Dur-o-wal exceeds accepted standards—increases the flexural strength of a masonry wall 71 to 261 per cent, depending on weight Dur-o-wal used, type of mortar, number of courses.

A study by the Armour Research Foundation indicates that Dur-o-wal tied walls outfunction brick-header tied walls. Write to any Dur-o-wal address below for a copy of Armour's 44-page report.

Two engineered products that meet a need. Dur-o-wal reinforcement, shown above, and Rapid Control Joint, below. This ready-made control structure flexes with the wall. Recommended by construction engineers especially for concrete block.

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- Dur-O-wal Prod., Inc., 4500 E. Lombard St., BALTIMORE, MD.
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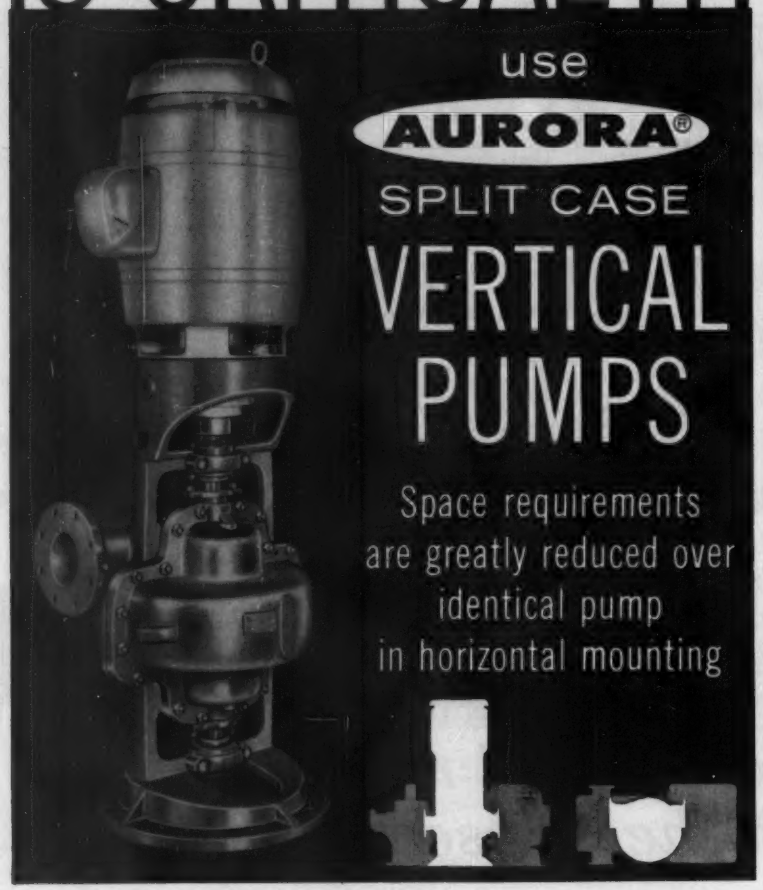

In addition to the substantial reduction in floor space with the vertical base mounting, these pumps have opposed suction and discharge connections which permits rotation of the unit to accommodate simplified piping, saving wall space and reducing installation costs.

All of the easy-accessibility features of the horizontal split case pumps are retained. Simply remove the cover for inspection, adjustment, or removal of the rotating element without disturbing the piping or motor.

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invited Minnesota Mining to present the program at their October 18 gathering. The Association members will hear about the advantages of putting plans and specs on microfilm.

GAO in the Dakotas

The latest report to Congress from the General Accounting Office shows that even states who do not use consulting engineers have their troubles. (The GAO, in the past, has been critical of the use of engineers in private practice on the Interstate Highway Program.)

The Bureau of Public Roads reimburses states doing their own engineering and supervision on the basis of an approved percentage of construction costs. GAO discovered that South Dakota had been overpaid by $37,000 during a period of several months.

In 1958, South Dakota was to be repaid on a basis of 5.7 percent of construction costs. On September 30, 1958, South Dakota submitted an annual report on which the basis of costs for the next year were to be computed. The Bureau did not approve the report until late January 1959. Since the next year's approved percentage was to be 4.6 percent, South Dakota had been overpaid by $37,000 on the old percentage basis from September through January. The Bureau is applying to have this money refunded to the government.

Also in the Dakotas, the engineers' estimates are too much at variance with construction bids, GAO says. In South Dakota, engineering estimates ranged from 36 percent above contracts awarded to 14.3 percent below. In North Dakota, estimates ranged from 44.6 percent above contract awards to 20.7 percent below.

The Bureau advised GAO that "(1) Both states maintain current pricing guides; (2) since October 1959, Bureau operating instructions require careful consideration of engineers' estimates; and (3) the Bureau does not consider that there

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has been any laxity on the part of Bureau or state personnel in the preparation and review of engineering estimates." However, the Bureau did not offer any reasons for the predominance of engineers' estimates substantially in excess of contract awards in the two states.

Study of Consultants

President Kennedy has set December 1 as the deadline for an investigation of the use of consultants for "the operation and management of research and development facilities and programs, for analytical studies and advisory services, and for technical supervision of weapons systems, and other programs administered on a systems basis."

In his letter to the Budget Director, the President explained that, "In part, the use of such contracts has been made necessary by the government's entry into new fields, such as atomic energy, missile development, and space exploration, and the need for talents and services not previously employed by the government.

"In part, the use of contracts has also been induced by the recommendations by the Second Hoover Commission and other groups, that the government terminate activities which could better be performed for it by private enterprise."

Areas to which the Budget Director has been ordered to give special attention are:

"(1) The effect of the use of contractors (consultants) on direct personnel systems; . . . the govern- personnel system, and the government's own capabilities, including the capability to review contractor operations and carry on scientific and technical work in areas where the contract device has not been used; and policies and actions needed to increase the government's capabilities to perform in these respects;

"(2) The policies, if any, that the government should follow in controlling the appointment, management, and dismissal of such [engineering] personnel;

"(3) The criteria to be used in determining whether to perform a service or function through a contractor or through direct Federal operations, including any special considerations to be given to the nature of the contractor (consultant) and his relationship to production contractors;

"(4) The policies which should apply in selecting contractors, including the organization of institutions for the sole purpose of entering into contracts with the government;

"(5) The means for reviewing and supervising contractor operations, and for achieving maximum efficiency in such operations; and

"(6) The policies which should apply with respect to contractor fees and cost reimbursement practices on items such as overhead, facilities and equipment, and advertising and promotion."

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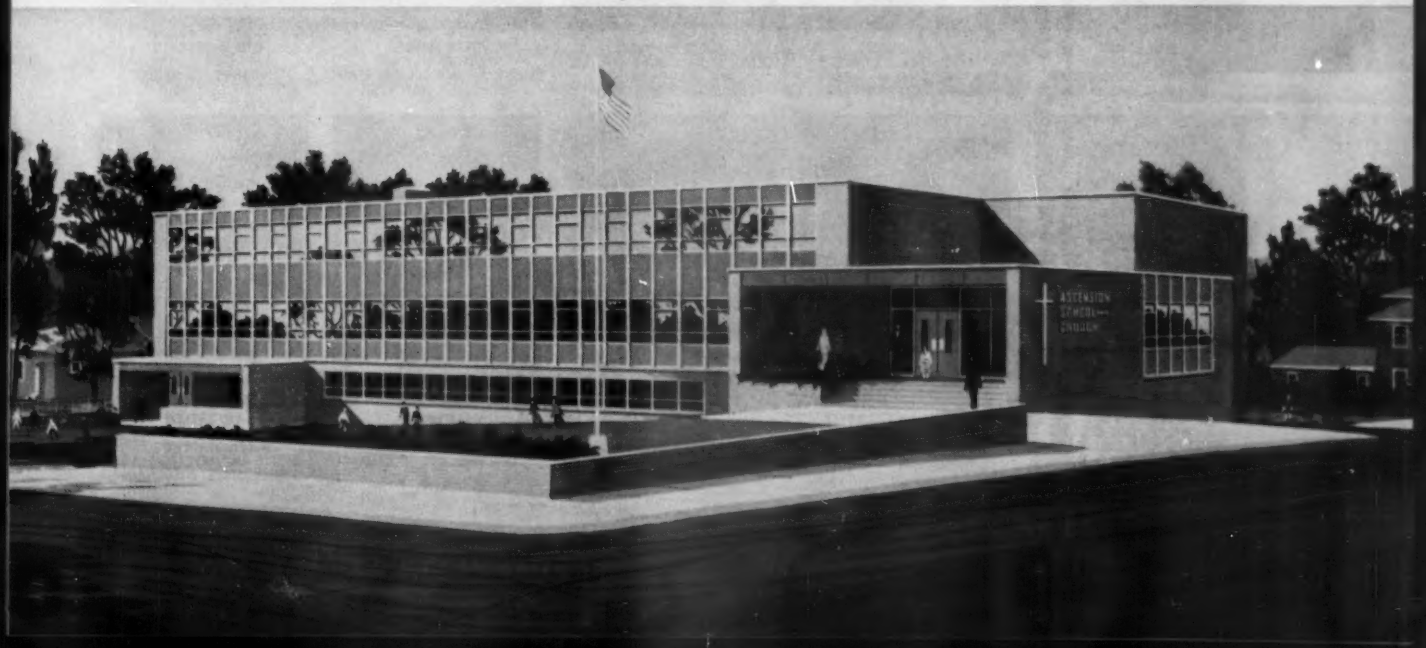

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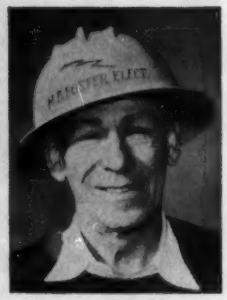

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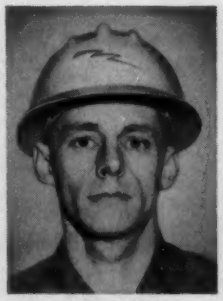

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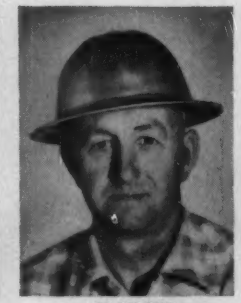

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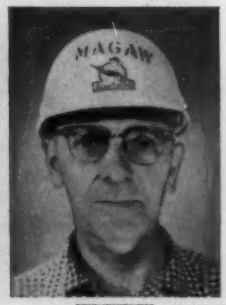

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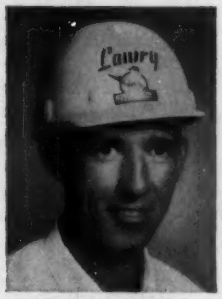

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Type NF's special advantages are: a large cell capacity for electrification, wide 24 in. coverage, a flat bottom surface which requires less sprayed-on fireproofing, and a design that provides economical spans up to 16 ft. Where full electrification is not required, NF Celluflor may be used in a blend with new Inland Type N Steel Roof Deck for further savings.

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Societies Occupy New Home

United Engineering Center in Full Swing

MARJORIE ODEN, Eastern Editor

Field Notes

NINETEEN engineering societies now are getting settled in their new United Engineering Center offices, preparing for the big day next month when the new facilities will be dedicated formally. The building is the answer to the dreams of most society personnel, who were quite happy to exchange life in the wholesale hat district for the plush United Nations Plaza.

Although not designed to handle major Founder Society meetings, the headquarters does have a meeting room that can handle up to 400 persons. This same room can be divided into three smaller meeting areas. Nearby, smaller meeting rooms can accommodate a total of 100 persons. In addition, the major societies have modern and colorful meeting areas on the various floors.

Food, Yes . . . Drinks, Maybe

Another "plus" for the new building is a large employee cafeteria looking out on a courtyard, as well as private dining rooms which can be reserved by the tenants. Rumor has it that the cafeteria caterer, Schraft's, has applied for a liquor license, so engineers attending luncheon meetings will not have to forego their noontime cocktail. Some of New York City's most plush restaurants also are near by.

Since it does not have the proper tax classification, the Engineers' Club cannot move into the new building, and plans to stay at its present West 39th Street location.

The exterior of the new headquarters is in glass, steel, and limestone. The glass panels are in "annual report blue." The building includes a 20-story tower, with the top two floors used for mechanical equipment and the 15th and 16th floors left temporarily unfinished.

There are three 50-ft trusses over the main meeting room supporting the present third floor and roof. Future expansion plans include building over this area to the 12th floor. Four arc-welded girders over the library stack area also support the present roof. Part of this area can be extended to the eighth floor.

For engineers accustomed to the musty atmosphere and the police precinct station decor of the old headquarters, the new building will present quite a contrast.

The main lobby, on 47th Street near United Nations Plaza, is in terrazzo and marble. A large Hall of Engineering Progress is located to the right, as you come in the door. Theme for the hall will be "Promise of the Future," and because the committee still is deciding "exactly what we want," the area will be developed later.

Up a short flight of marble steps, edged with a modern stainless steel railing, is the library. With greatly expanded space, the library personnel have been busy for two months getting the six and one-half miles of books (measured as they stand on the shelves) in order. The library presently has three stories of stacks, with two stack areas left for future growth.

In addition to the modern reading room and stack areas, "behind the scenes" conditions for library personnel will present quite a change. The library once was famous for what many swore was a midget's bathtub, used for a developing tank. It was with a slight twinge of nostalgia that the librarians left it behind. For library people working late, a small dining area with a refrigerator has been provided. No society has similar facilities. The directors' office is one of the most modest in the building, but it is adequate.

Decoration and Ostentation

Throughout the Society section of the building, bright colors and new furniture will prevail in most areas. Society secretaries generally will have corner offices overlooking the United Nations. Carpet and matching grasscloth wallpaper are typical status symbols. The Mechanicals (the only society taking three floors) even have provided a small office for the president.

Keeping the floors as "open" as possible, many use glass walls. Most of the glass is opaque, but the American Institute of Consulting Engineers has clear glass looking out into the elevator area in their space on the third floor. Some societies have glass with a swirled

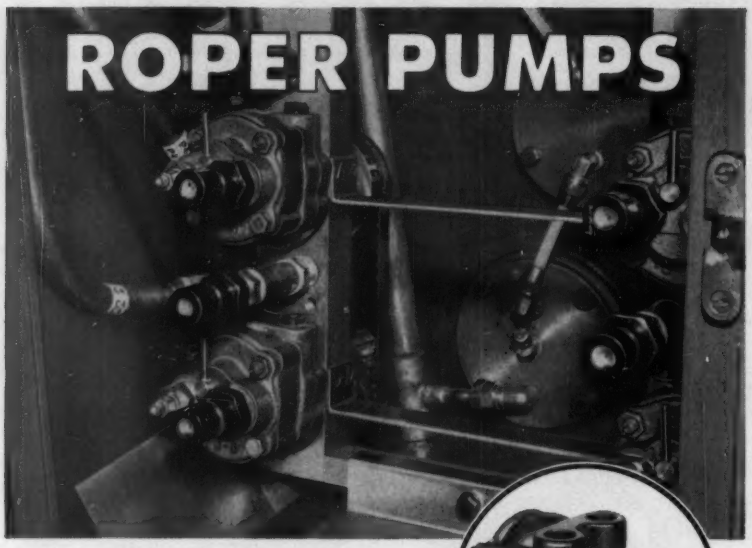
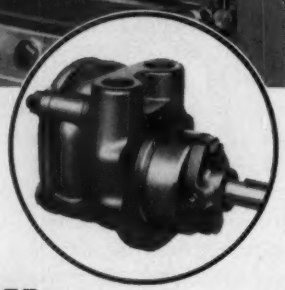


Photo courtesy R. Hoe & Co., Inc.

SERIES K FIGURE 17K3



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pattern that might bother anyone prone to seasickness.

Many groups are buying all new furniture. The American Society of Civil Engineers, planning on the move, had bought nothing for many years. They are taking only their most valuable mementos, and have spent an estimated $100,000 furnishing the 17th and 18th floors. The American Institute of Electrical Engineers is spending about $150,000 on new furnishings, and the EEs are taking only a few file cabinets from the old building. The American Institute of Mining, Metallurgical, and Petroleum Engineers has spent most of its money on built-ins (shelving and bookcases).

Throughout the building, closets have sliding doors of brilliant and often contrasting colors. Files are used as dividers in many areas, saving space through the use of "file banks." The Civils have a central file area on both of their floors, connected by an elevator.

Lighting throughout was designed to produce 75 foot-candles in open areas, through modular arrangement of recessed fluorescent fixtures operating on 265 volts. The only exception, the exhibition area, has incandescent lighting.

The Society of Illuminating Engineers, which spends much of its time recommending a 150-foot-candle minimum, caused somewhat of a flurry when it spent $20,000 to bring their area up to 200 foot-candles. The sum included an additional five-ton air conditioning unit. The IES was allowed to change only the interior lighting of their area, since UET officials did not want the ninth floor front to present a sharp nighttime contrast to the less brightly lit floors.

Air conditioning, designed by Jaros, Baum & Bolles, is a "first of its type," which is appropriate for an engineering building. A peripheral high-pressure induction system was used. Instead of modulating the amount of hot and cold water in the mixing boxes, the thermostats at headquarters regulate the

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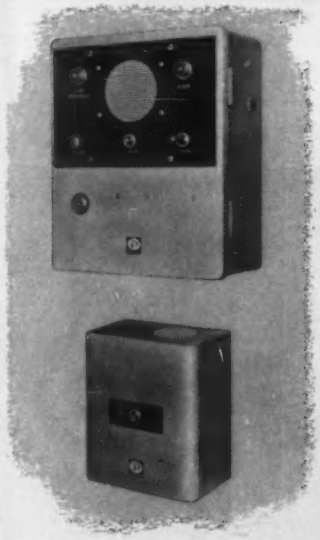

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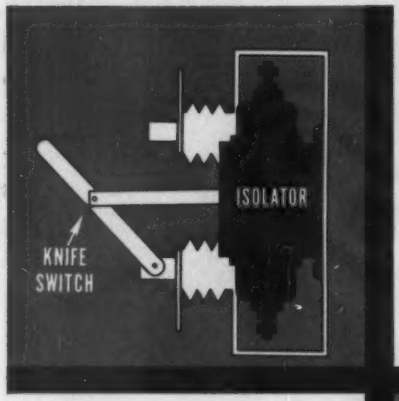
are the most practical disconnect you can buy!



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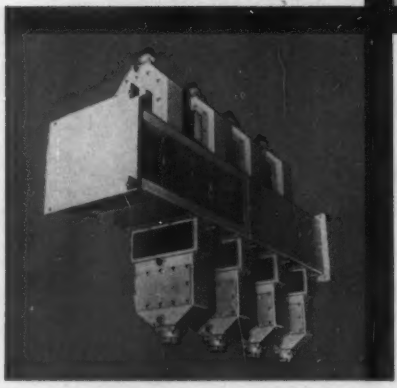

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amount of air passed over the heating and cooling surfaces. For interior areas, a medium-pressure system is used; each ceiling outlet has a pressure reducing device.

On the 20th story, two refrigerating machines are installed. One centrifugal and one absorption unit are arranged to utilize steam twice – first to drive the turbine compressor of the centrifugal machine, and then to supply the heat energy necessary for the operation of the absorption machine.

According to Seelye, Stevenson, Value & Knecht, the building is welded throughout. "A study was made of the three possible methods of field connection – rivets, high-strength bolts, and welding. Welding was found to give a compact design for wind bracing." To maintain economical story height, the ducts and pipes are threaded through the girders.

Headquarters, like most other buildings, had its "conversation point" during the moving. According to some of the building workers, the loading dock is slanted so steeply that a truck backing in would dump its load when the doors were opened. There also was a tense moment when one large truck backed in, unloaded and scraped the top of the door.

The architect, Shreve, Lamb & Harmon, explained that "the dock complies with the building codes on maximum slant, and most trucks could use it if they would try. Of course, it wasn't designed for trucks such as the one that got stuck."

Meanwhile, the old headquarters building, constructed more than 50 years ago with funds donated by Andrew Carnegie, has an undecided future. In late 1960, an announcement was made that Develop Realty Corporation had purchased the building for $1.5 million and was going to turn it into a Textile Center, complete with a Health Club. Sale negotiations apparently fell through, since the building was advertised for sale in the *New York Times* in August. ▲▲

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AAF cleans, heats, moves air

A battery of AAF dry-type dust collectors exhausting grinding operations. After-cleaners on collectors provide for re-circulation of cleaned air.

AAF packaged central station air handling units, suspended from the ceiling in the warehouse, save valuable space, provide quiet operation.

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AIR CLEANING PRODUCTS
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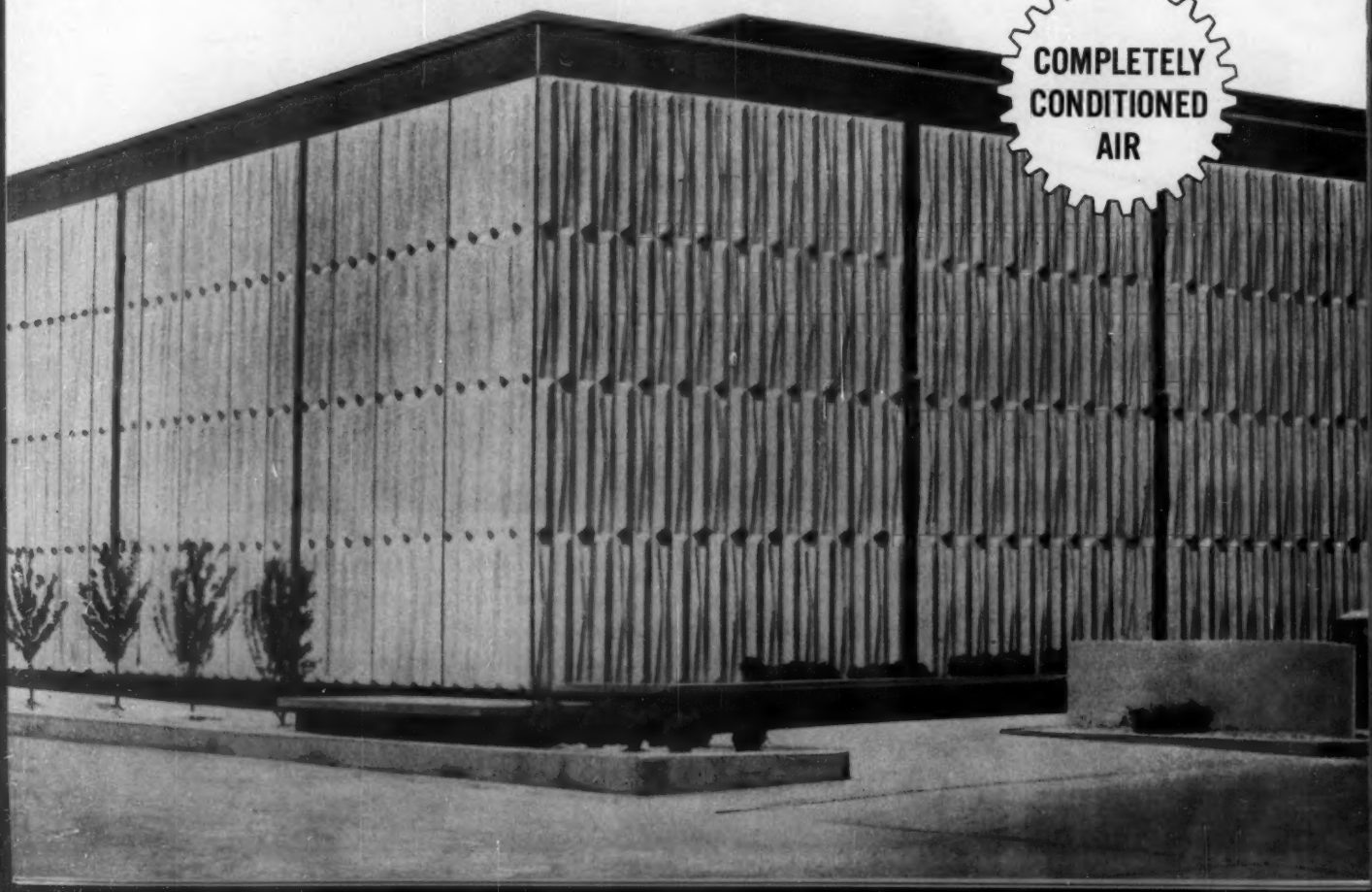
COMPLETELY CONDITIONED AIR

AAF electronic air cleaners provide clean air for the Maytag Headquarters Building, Newton, Iowa. Architects: Brooks-Borg, Des Moines. Air Conditioning Engineer: William Nanes, Des Moines.



to make it work for Maytag

Multi-product installation demonstrates AAF's capability for complete air engineering

THE manufacture of major appliances demands that air be put to work in many different ways. Here are the jobs it had to do at the Maytag office and plants in Newton, Iowa: (1) help keep the interior of the impressive new headquarters building perpetually clean, (2) control dust from grinding operations, (3) provide heating and ventilating for the warehouse and service repair area, (4) control dust from polishing operations, (5) provide proper exhaust from plant and processing operations, and (6) help provide a dust-free atmosphere in the enameling department.

AAF is the only company that provides *all* the major components for *completely* conditioned air. Just as important, AAF offers the knowledge and experience to coordinate the functioning of these components into one integrated system.

If air must do many jobs in the building you are planning, talk with AAF. Booklet 518 describes the complete line of AAF component products. If you would like a free copy, address Richard W. Smith, American Air Filter Company, Inc., 300 Central Ave., Louisville, Ky. In Canada: American Air Filter of Canada, Ltd., 300 Stinson Blvd., Montreal 9.

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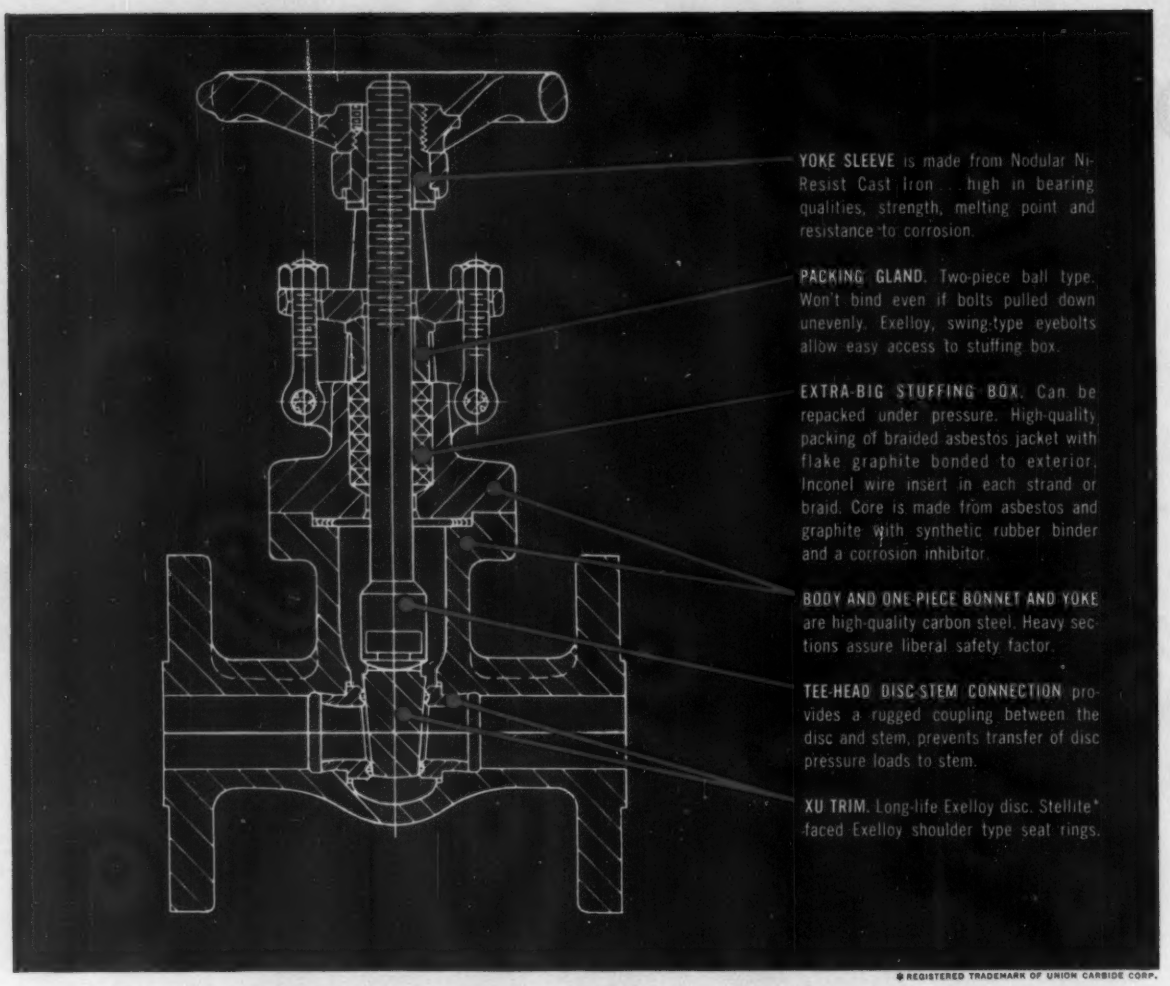
● *Italics denote products used at Maytag installation.*


YOKE SLEEVE is made from Nodular Ni-Resist Cast Iron . . . high in bearing qualities, strength, melting point and resistance to corrosion.
PACKING GLAND. Two-piece ball type. Won't bind even if bolts pulled down unevenly. Exelloy, swing-type eyebolts allow easy access to stuffing box.
EXTRA-BIG STUFFING BOX. Can be repacked under pressure. High-quality packing of braided asbestos jacket with flake graphite bonded to exterior. Inconel wire insert in each strand or braid. Core is made from asbestos and graphite with synthetic rubber binder and a corrosion inhibitor.
BODY AND ONE-PIECE BONNET AND YOKE are high-quality carbon steel. Heavy sections assure liberal safety factor.
TEE-HEAD DISC-STEM CONNECTION provides a rugged coupling between the disc and stem, prevents transfer of disc pressure loads to stem.
XU TRIM. Long-life Exelloy disc. Stellite* faced Exelloy shoulder type seat rings.

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Crane adds flanged 150 & 300-pound steel gate valves to famous 3600 series.

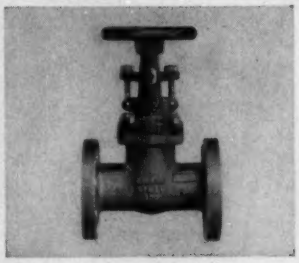
Gives you a complete line of Small Steel Gate Valves suitable for all services at temperatures up to 1000 F. Available in sizes ½" to 2". Gives you design refinements generally associated only with higher priced valves.

The drawing illustrates only a few of the important features of these superior valves. There is built-in quality and reliability in every detail. Outside screw and yoke ruggedly constructed. Stem is heat treated Crane Exelloy. Bonnet joint gasket of spiral wound, Type 316 stainless steel with asbestos filler.

The cast steel 150 & 300-pound valves have "XU" trim and flanged ends (face-to-face conforms to ASA B — 16. 10) . . . figure numbers 3510XU (150 pound) and 3514XU (300 pound).

With the addition of these new valves to the 3600 Series, Crane now offers you the industry's finest choice of quality, small steel valves. All of them are ideally suited for use with steam, water, air, gas, oil, oil vapor, gasoline, fuel oil and similar services.

More details from your Crane distributor. Or write to Crane Co., Dept. U, Industrial Products Group, 4100 South Kedzie Ave., Chicago 32, Ill. In Canada: Crane Ltd., 1170 Beaver Hall Square, Montreal.



AT THE
HEART
OF HOME AND
INDUSTRY

CRANE

VALVES AND PIPING
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PLUMBING
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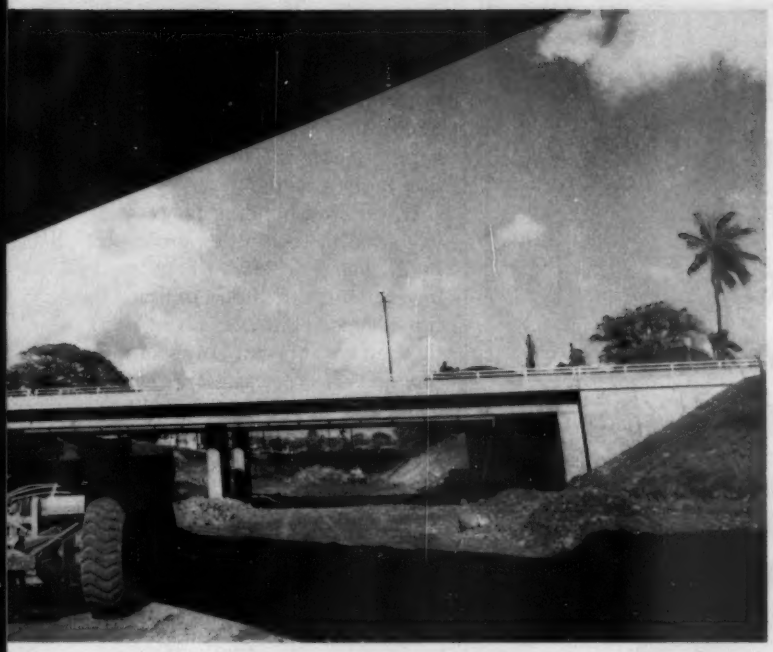

Consultants in the 50th State

The Lunalilo Freeway includes Hawaii's first three-level interchange.

EXPANDING military installations throughout the Pacific, statehood, a population increase, and the constant demand for new tourist facilities have given Hawaii an engineering climate as inviting as the warm sun of Waikiki Beach.

The population of Honolulu is less than a third of a million, but there are more than 40 consulting engineering firms listed in the phone book. That figures out to nearly twice as many consultants as there were two years ago, and seven times as many as there were five years ago. The reason for the phenomenal increase is the large area open to Hawaii-based firms. These engineers get projects ranging all the way across the Pacific. In addition, Honolulu firms operate on a true state-wide basis, unlike most mainland firms. Virtually all the work done in the state is handled by consultants in the capital.

Industry and Tourists

Expanding industrial sites and the enormous tourist trade provide much of the work here. Several industrial parks are being planned, most notably the one on Leeward Oahu. The amount and scope of Hawaiian industry are sure to increase as more and more people move here from the mainland. Of course, this expanding population also means additional housing, shopping centers, recreational areas, offices, and service facilities.

Even more numerous than the permanent newcomers are the tourists; by 1970, Hawaii expects one million visitors a year — four times the current number. This will mean a continued boom in hotels, restaurants, amusement spots, and related tourist facilities.

Military Contracts

Certainly, there would not be so many consulting engineers in Hawaii if it were not for military contracts. Not only do the three services provide a large portion of the work for local firms, they also bring in mainland firms, who may set up Hawaiian offices just to handle one big project in the Pacific. Some of these mainland firms have maintained their Hawaiian offices after concluding a project. Other large firms, as they complete a major job, cut back on their staffs. Many of the thus-unemployed engineers, rather than move back to the mainland, open their own offices. Thus, there are many one- and two-man firms now in Hawaii.

The military demand for engineering services seems certain to remain high for many years to come. There probably will not be so much work on airports and government housing projects (currently the staples in the Hawaiian consultant's diet), but the increase in missile sites and tracking stations should more than make up for it.

Highways

The biggest spurt in engineering activity is expected when the Federal government frees $225 million for work on the island sections of the Interstate Highway project. Hawaii was denied access to Fed-

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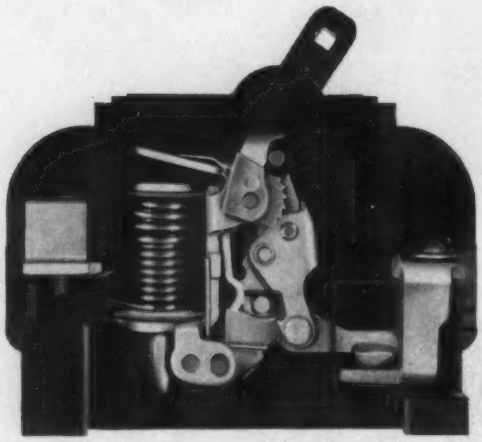
TEMPERATURE-STABLE.
NO DERATING.
NO TEMPERATURE COMPENSATION
OF ANY KIND.



THE BREAKER'S NAME: HEINEMANN.
IT'S THE ONE TO SPECIFY
FOR NO-TROUBLE SERVICE
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eral funds so long as it remained a territory; however, now that it has achieved statehood, all that is needed for Federal support is state approval of a $1.5 million a year appropriation as Hawaii's contribution to the program.

It was road-building that actually started the consulting profession in Hawaii. In 1950, there were fewer than a half-dozen firms in the islands. However, about 1954 the territory began an extensive program of freeway construction, including several bridges and tunnels. Consultants have prospered and increased ever since.

Firms

Typical of the locally-based firms is Belt, Collins and Associates, whose main office is in Honolulu. Among other projects, BC&A has handled the Lunalilo Freeway, military housing, schools, and the new State Capitol. Geographically, the firm has worked throughout the Pacific, from Hawaii to the Philippines. It was formed eight years ago, with a three-man staff, and now has a staff of about 50, including 15 engineers.

Indenco Engineers, Inc., is one of the mainland firms that maintains an island office. The Indenco office in Honolulu varies in size as the work demands. At present, there is a five-man staff, but during peak activity periods, it may increase to as many as 20. Like BC&A, Indenco has ranged far afield, handling jobs on Guam, Midway, and other Pacific islands.

Associations

Most of the major engineering societies are represented in Hawaii, and they are expanding with the profession. The Hawaii Society of Professional Engineers recently organized a functional section for engineers in private practice. The section was planned originally for a limited membership of 50, but it seems unlikely that the limitation will stand. Engineers, and engineering, are growing very fast. ▲▲

WEINMAN PUMPS
give Florida Bank Building
PERFECT WEATHER
in every office

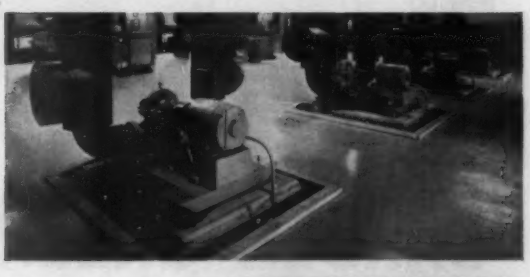
The First National Bank Building, with its blank north and south walls, provides downtown Orlando, Florida, with a striking new landmark. Bank facilities occupy the first four stories of the 160,000 square foot structure. The other eight floors provide modern, spacious quarters for many of Orlando's business and professional people.

And . . . in Florida . . . air conditioning is important. That's why the First National Bank of Orlando depends on a 2-unit, 550-ton Carrier Hydronic System to give the bank perfect year 'round climate no matter what the weather is outside. And, that's why each Carrier unit relies on a Weinman Pump for instant and efficient circulation of chilled (45°F.) or hot water throughout the system. A Weinman Pump also delivers chilled water to the primary air fan for precision control of humidity at 55°F. Still another Weinman Pump (with standby) circulates water continuously through the system's chill water loop.

And, other offices in the First National Building get the same ideal climate from one of 389 Carrier modular, under-window units that permit individual offices to "dial" the weather they want without effecting any other office. Two Weinman Pumps deliver hot or chilled water instantly to each of these units upon demand.

In addition, two Weinman Duplex Condensate Return Units provide the First National Bank Building with fast, efficient steam condensate return and a Weinman Non-Clog Type Pump removes sanitary waste and basement seepage.

One of the South's most modern banking facilities, The First National Bank of Orlando, features functional design in brick, glass and marble with dramatic horizontal and vertical lines. Architect: Kemp, Bunch and Jackson, Jacksonville, Fla.; Consulting Engineer: VanWagenen, Taylor and VanWagenen, Jacksonville; General Contractor: Sipple, Thompson and Street, Orlando, Fla., and Mechanical Contractor: Wrenn Brothers, Rock Hill, South Carolina.



Note the neat installations of some of the 12 Weinman Pumps used for circulating hot and chilled water through the 12 story building's air conditioning system.

Like many another user, officials of The First National Bank of Orlando have found Weinman Pumps exceed requirements for efficient, economical, low-maintenance pumping. To solve *your* pumping problem, call your Weinman Centrifugal Specialist today . . . he's in the Yellow Pages. Or, if you prefer, write us direct.

THE WEINMAN PUMP MFG. CO.
290 SPRUCE STREET COLUMBUS 15, OHIO
CENTRIFUGAL SPECIALISTS

BARBER-GREENES PLAY KEY ROLE ON 47 BIG DAM JOBS

Barber-Greene belt conveyor systems were used on 47 big dam jobs for such diverse materials handling applications as moving a mountain at 3,600 tph, aggregate stockpiling and reclaiming, and getting peak production out of aggregate and concrete mixing plants at the site.

Big contracting firms and big contractor combines selected Barber-Greenes for 12 TVA dams and 35 other dam projects scattered through 18 states for many reasons, including the one of prime importance: Barber-Greene belt conveyors move bulk materials at lowest cost per ton.

Get proof by asking your Barber-Greene representative for a belt conveyor system layout and quote on your next job.

Your belt conveyor equipment headquarters

Representatives in Principal Cities of the World

Barber-Greene BG

Main Office and Plant AURORA, ILLINOIS, U. S. A.
Other Plants: DeKalb, Milwaukee, Detroit, Canada, England, Brazil, Australia

CONVEYORS • LOADERS • DITCHERS
ASPHALT PAVING EQUIPMENT

11 MILLION TONS OF EARTH FILL RIDES DOWN A MOUNTAIN AT TRINITY DAM

Two miles of belt conveyors equipped with over 2,600 Barber-Greene heavy-duty idlers moved 11 million tons of earth fill down a mountain at capacities ranging up to 3,600 tph during construction of Trinity Dam in northern California.

About half of this system ran on a 25% downgrade, and the weight of the material on the belts was harnessed to provide electric power for a portion of this big project.

Although they operated virtually around the clock for three years, the idlers were in excellent condition upon completion of the project and will be sold for re-use on other installations.

1,100,000 YDS. OF CONCRETE IN MASSIVE FOLSOM DAM

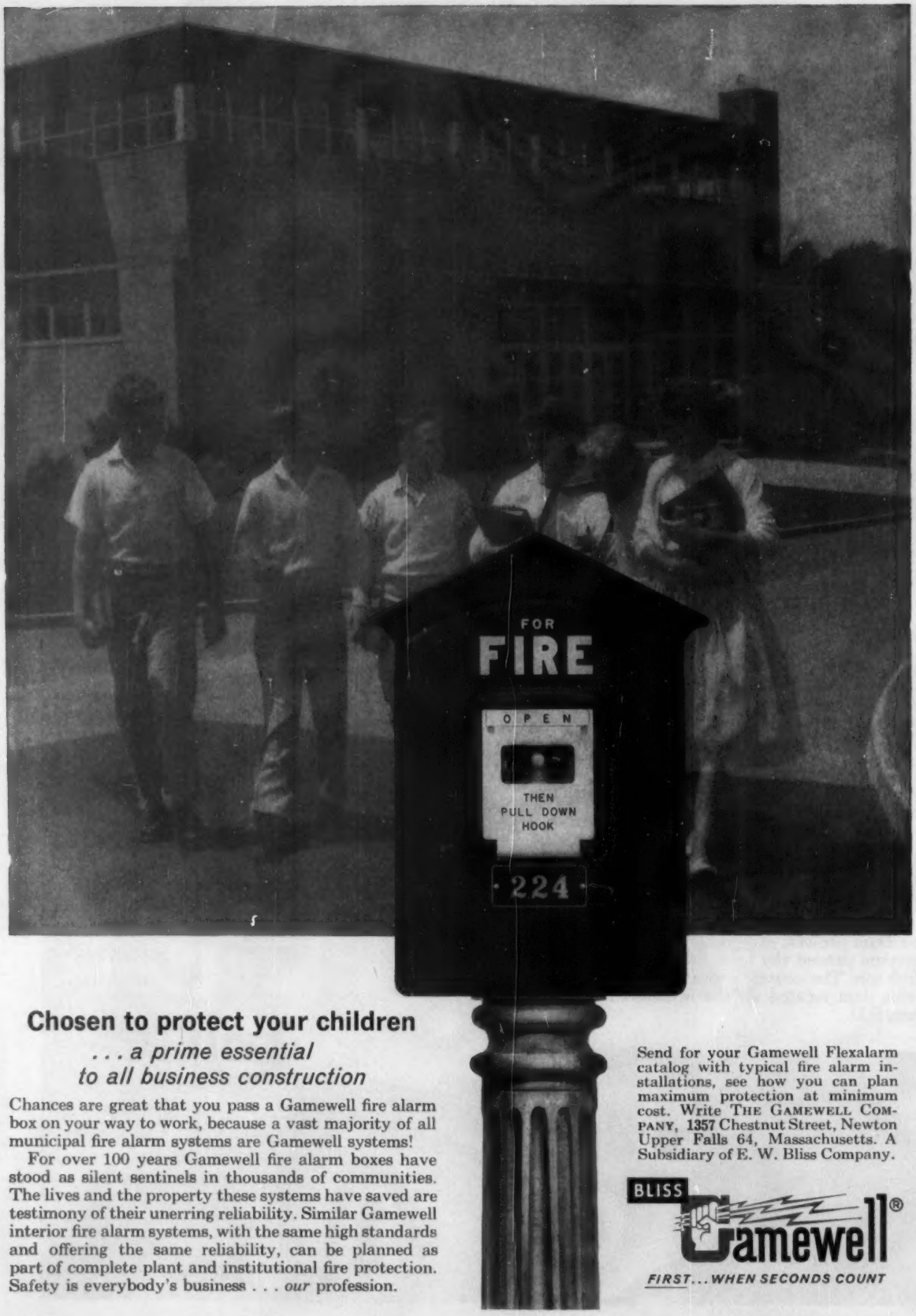
Barber-Greene belt conveyors played a dual role at Folsom Dam: nearly 1,100 ft of conveyors moved materials at the 700 tph aggregate plant shown; and five flights of conveyors were in use at the concrete mixing plant where 1,100,000 cu. yds. of mix was produced for this gigantic structure.

5,659-FT. OF BARBER-GREENES AT WORK ON $107,955,000 GLEN CANYON DAM PROJECT

More than a mile of Barber-Greene belt conveyors are at work on the $107,955,000 Glen Canyon Dam project scheduled for completion in 1965. The contractor uses these conveyors in the 1,400 tph aggregate plant as well as for aggregate stockpiling and moving aggregates to the mixer in the concrete mixing plant. This project, located on the Colorado River on the Arizona-Utah border, is the largest contract ever awarded by the Bureau of Reclamation, and is the biggest competitive contract ever awarded to a single contractor.

EXTENDIBLE BARBER-GREENE CONVEYOR SPEEDS SPILLWAY TUNNELING AT OAHE DAM

As boring machines cut spillway tunnels on the Oahe Dam project, extendible Barber-Greene belt conveyors carried the rock away from the cutters at 640 tph. The conveyor system totalled 2,056 ft on this dam located on the Missouri River near Pierre, S.D.



Chosen to protect your children

. . . a prime essential
to all business construction

Chances are great that you pass a Gamewell fire alarm box on your way to work, because a vast majority of all municipal fire alarm systems are Gamewell systems!

For over 100 years Gamewell fire alarm boxes have stood as silent sentinels in thousands of communities. The lives and the property these systems have saved are testimony of their unerring reliability. Similar Gamewell interior fire alarm systems, with the same high standards and offering the same reliability, can be planned as part of complete plant and institutional fire protection. Safety is everybody's business . . . *our* profession.

Send for your Gamewell Flexalarm catalog with typical fire alarm installations, see how you can plan maximum protection at minimum cost. Write THE GAMEWELL COMPANY, 1357 Chestnut Street, Newton Upper Falls 64, Massachusetts. A Subsidiary of E. W. Bliss Company.

BLISS Gamewell®

FIRST... WHEN SECONDS COUNT

Britannia Rules Beyond the Waves

British Engineering Leads In Foreign Projects

A RECENT TABULATION showed that 60 United Kingdom contracting companies operated in 65 countries and completed £120 million ($335 million) in contracts in 1959. Members of the British Association of Consulting Engineers are now working in 98 countries on contracts totaling some $2.2 billion. Much of this work is in Africa, particularly the Republic of South Africa, where work is progressing on airports; electrical and mechanical projects; power stations and lines; and water supply systems.

This far-flung engineering and construction activity cannot be regarded simply as Britain's proportional share of international works. Their present eminence in international design and construction is traceable directly to a 200-year-old tradition of exporting engineers, materials, and capital overseas, to colonies, protectorates, and others.

Electronics

Great Britain is reputedly the world's largest exporter of electronic components and electrical apparatus. One British firm has furnished over a third of the world's maritime service and navies of 33 nations with radar gear; and another British firm has supplied radar for the ships of 29 more countries. British installations include a transistorized telephone service for interior Australia, a repeater submarine telephone cable between Canada's mainland and New Foundland, a submarine telephone cable between Sweden and England, and another similar submarine cable between Florida and Puerto Rico.

Roads and Railroads

The design and construction of roads and railroads propelled the British into the international construction market. Railroad pioneers like Thomas Brassey and his contemporaries were responsible for designing and building railroads in greater Europe, South America, Canada, India, Africa, and Australia. China's first railroad and some 40,000 miles of Indian and Pakistani railroads also were British designed and built.

Eighteenth century road engineers like Metcalf, Telford, and McAdam brought scientific engineering to road building, and the results of their individual work were applied on such projects as the 1500-mile Grand Trunk Road in India (1828-1864), and the Tuli-Port Salisbury Road in Africa. Recent British projects include highways and streets in Accra, 4000 miles of road in Iran, and subsidized road work in Nigeria and other protectorates.

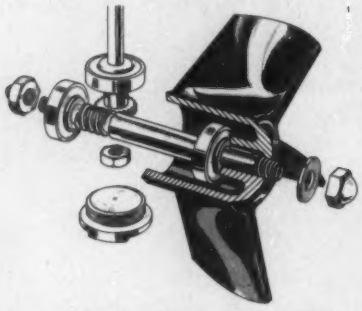
Bridges

British engineered and constructed bridges also pepper the interna-

SPARLING METERING TOPICS

Design and Durability of Propeller Meters Insure Low Maintenance

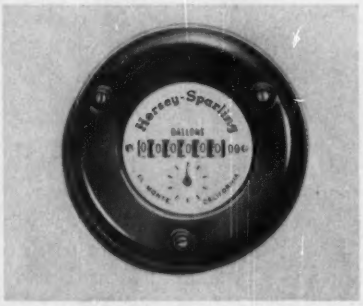
SIMPLICITY OF DESIGN and rugged construction insure years of trouble-free operation with propeller meters. The only moving parts are an accurately molded one-piece propeller, two shafts, self-flushing bearings and a simple worm and gear mechanism. All parts are of material specifically adapted to service requirements. For example, the propeller of a Sparling meter is molded of a tough, resilient plastic that holds the exact pitch and set of the blades for the life of the propeller. Bearings, shafts, and the worm and gear mechanisms are of stainless steel. Change gears are readily accessible should units of registration need to be changed.



Periodic inspection and one-point lubrication are usually all the maintenance required for a propeller meter. When further service is necessary the entire meterhead may be easily removed as a unit with minimum shutdown time.

ACCURACY...Sparling main-line propeller meters consistently register total flow with accuracy guaranteed to be within 2% of true flow, at all velocities within the rated range of the meter. Each meter is individually tested at the factory to establish its true index; then it is properly geared to maintain accurate registration.

DIRECT TOTALIZING...No conversion charts, tables or computations are needed with a Sparling propeller-type meter. Total flow is read direct on the 6-digit, straight reading totalizer furnished in standard volumetric units specified. If both total flow, and rate of flow are required, a Sparling meter-mounted Type 245 Indicator-Totalizer can be utilized. Suitable instrumentation and controls for remote reading and recording are available.



NEGLIGIBLE HEAD LOSS...The straight full pipe size bore of a Sparling meter offers the minimum interference to flow. Pressure recovery equipment is not necessary. A propeller-type meter operates with the same high degree of efficiency in any position—horizontal, vertical or at an angle—and may be placed in either the pump suction or discharge piping.

COMPLETE RANGE...Sparling water control equipment has been specified for nearly 50 years by water and sewage works engineers and superintendents everywhere. A complete range of instrumentation and control equipment permits Sparling to meet most any main-line metering requirement. Ask your Sparling field representative for further information, or WRITE FOR CATALOG 315CE.

SPARLING WATER CONTROL EQUIPMENT

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tional scene. The structural contortions of these often spectacular projects attest to the engineers' skill and the contractors' fortitude and ingenuity. Some of the significant British bridges are the Victoria tubular bridge, designed by Robert Stephenson, over the St. Lawrence at Quebec; the Storstrom Bridge in Denmark, Europe's largest bridge; the 3770-ft Sydney (Australia) Harbour Bridge, built in 1932; and the $2.25 million Queensboro Bridge, under construction, near Vancouver, B. C. Substantial bridge engineering has been completed recently or is under construction throughout Africa.

Ports and Harbors

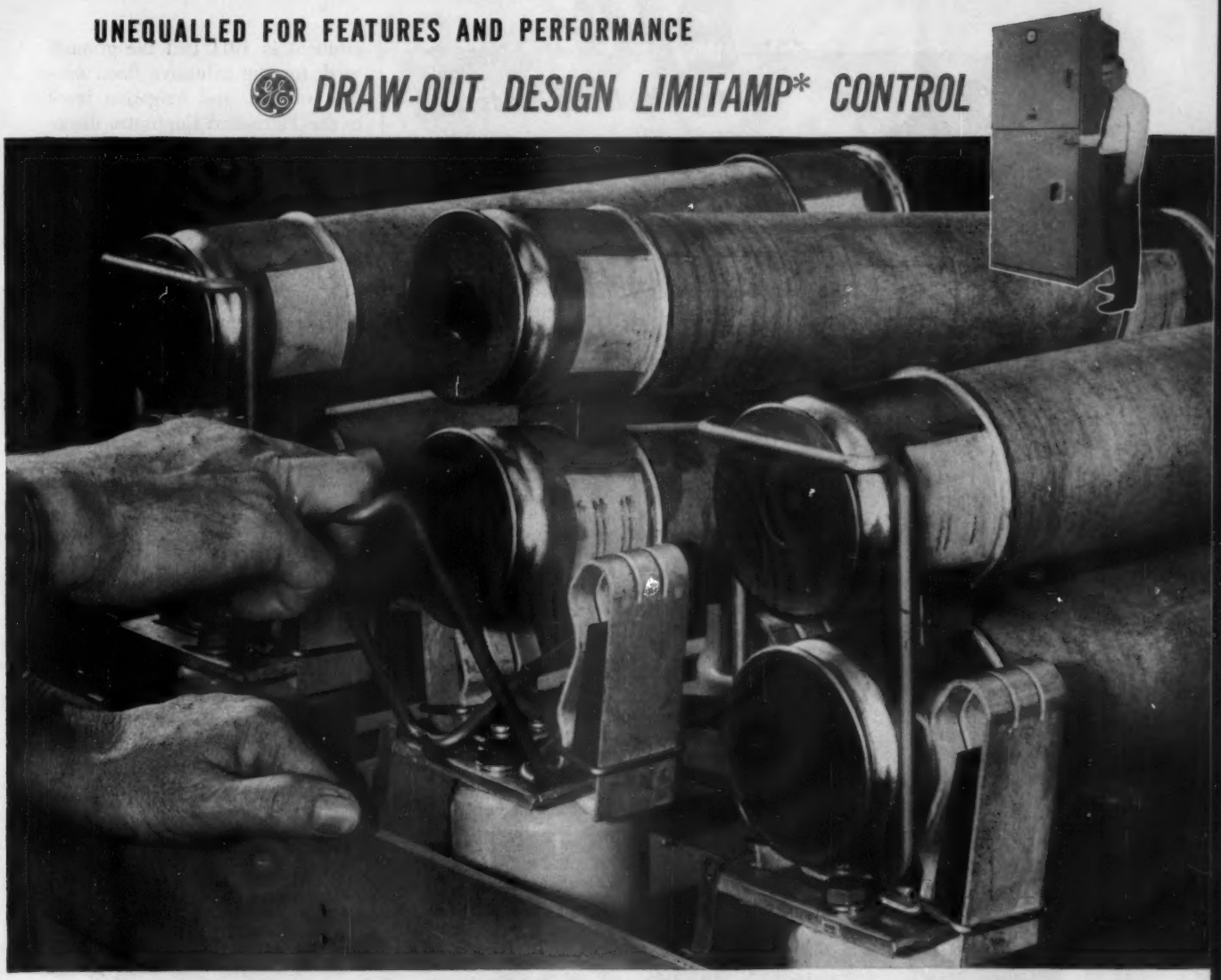
Because of the British maritime economy, United Kingdom engineers tend to excel in port development and harbor design. The early 19th century harbors in Hong Kong and Singapore, which, incidentally, are still being expanded, attest to their work. The Indian Ocean port of Colombo, also being expanded, and the ports of Tampico (Mexico) and Callao (Peru) were undertaken by the United Kingdom in the 19th century. Current or recently completed projects include port and harbor work at Bridgetown (Barbados, West Indies); oil jetties at Aden; and miscellaneous work in Bahrain, Kuwait, Berbera, Mombasa, and other ports.

Water Control

United Kingdom engineers have been involved in overseas river control and irrigation projects for a long time, particularly in the arid Middle East, India, and Pakistan. Egypt can thank the British for their doubled crop output, made possible by the 70-year construction program for barrages, dams, and irrigation projects on the Nile in Middle and Upper Egypt. Aswan Dam is part of this project, and the Sennar Dam on the Blue Nile implemented the Geizira irrigation plan. A report by Sir William Willcocks to the Ottoman gov-

UNEQUALLED FOR FEATURES AND PERFORMANCE

DRAW-OUT DESIGN LIMITAMP* CONTROL



INTERRUPTS IN 1/2 CYCLE

...protection when you need it—with Limitamp control

Here is performance you can count on ... to start, stop, and protect your motor under *your* environmental conditions!

General Electric's draw-out Limitamp control, rated 2300- to 4600-volts for a-c motors up to 3000 hp, interrupts in the first ½ cycle. Current is limited in the first ¼ cycle. EJ-2 fuses—the standard of excellence—give you this dependable short-circuit protection.

Performance of the draw-out contactor is outstanding under all load conditions—from small motors running light to large motors at "locked rotor." A new blow-out structure and an improved arc chute with superior extinguishing action provides this improved performance. What's more, the new Limitamp contactor meets a 60-kv base impulse level.

Complete design coordination and exhaustive testing in General Electric's high voltage laboratories of bus, cable, current transformers, contactors, fuses, insulators, and overload relays means top protection for men and equipment!

Ask your G-E sales representative about other advanced-design operation, installation, and maintenance features of new Limitamp control. Or, write today to Section 783-26, General Electric Company, Schenectady, New York for descriptive Bulletin GEA-6893.

Industry Control Dept., Salem, Va.

* Reg. Trade-mark of General Electric Co.

Progress Is Our Most Important Product

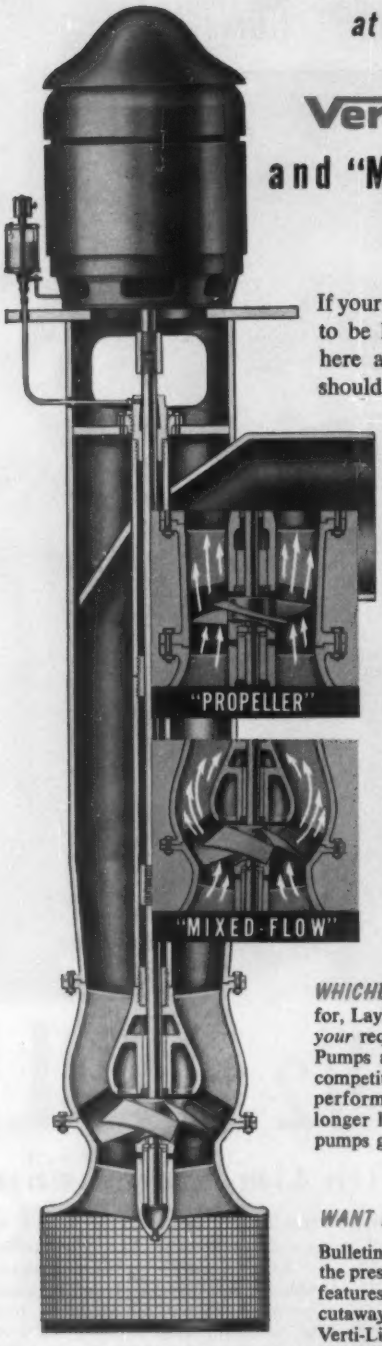
GENERAL ELECTRIC

FOR **BIG** VOLUMES

at Low to Moderate Heads...

Verti-Line® "PROPELLER" and "MIXED-FLOW" PUMPS

ARE THE ANSWER!



If your operations call for *big* volumes of water to be lifted against low to moderate heads, here are two Layne & Bowler Pumps you should know about...

VERTI-LINE "PROPELLER" PUMPS

use a propeller similar to that on a ship, lifting the water straight up the column to the discharge head. Simple, economical and virtually clog-free, Verti-Line "Propeller" Pumps are available in standard sizes to 70,000 G.P.M....and in Single or Multi-Stage designs!

VERTI-LINE "MIXED-FLOW" PUMPS

are similar in overall design to "Propeller" Pumps except that the impeller combines the straight-lift characteristics of the "Propeller" Pump with the centrifugal force of the "Turbine" Pump.

RESULT—the "Mixed-Flow" Pump lifts big volumes against even greater heads than does the straight "Propeller" design. Capacities to 75,000 G.P.M....Available in both Single and Multi-Stage designs!

WHICHEVER TYPE your particular operations call for, Layne & Bowler has the size and rating that fits *your* requirements. And remember...*all* Verti-Line Pumps are built *up* to performance—not down to competition. Yet you actually pay less for Verti-Line performance because of the extra performance, longer life, and lower maintenance these rugged pumps give!

WANT MORE FACTS?

Bulletin #1400, just off the press, gives design features, performance facts, cutaway views, etc., on Verti-Line "Propeller" and "Mixed- Flow" Pumps. Write for your free copy today!

**Verti-Line Pumps are the exclusive products of*

LAYNE & BOWLER PUMP COMPANY

LOS ANGELES 22

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ernment in 1911 laid the groundwork for the extensive flood control, storage, and irrigation work in the Tigris and Euphrates drainage system — work which is reinstating this area as the productive garden spot of historical fame. Other current projects include Dokan Dam (Iraq), irrigation projects in Ceylon and British Guiana, and a $70 million project in East Pakistan. Recently Hunting Technical Service Limited was awarded a $3 million drainage, salinity control investigation, and conservation project affecting 10 million acres on the lower Indus Valley in Pakistan.

Power

While power projects are often part of the dam and irrigation work of the British, mention of specific outstanding hydroelectric installations should include generating plants at Aswan (Egypt), Kariba (Rhodesia), Atiamuri (North New Zealand), and Robinson Falls (Malaya). In Africa, Owen Falls Dam in Uganda and smaller South African projects are in operation. A large hydroelectric plant was completed in January 1960 at Hirifanli, Turkey, on the Kizilmirak River.

Also allied with the river control and dam work, British built water supply and drainage projects are found in Baghdad, Kuwait, Khartoum, Tel Aviv, and Hong Kong. The Kuwait project is one of the first desalinization plants to be put into operation on a large scale. Other United Kingdom water supply projects can be found in Teheran, Freetown, Tamale, Suva, Trinidad, Tobago, and Jesselton.

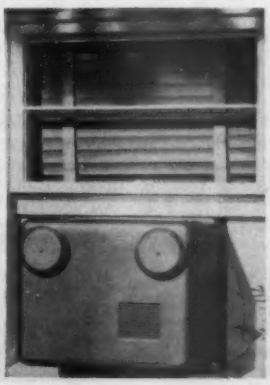
Industry

British engineering and construction have been involved heavily in worldwide industrial development. For instance, a joint venture of several United Kingdom and American oil firms is constructing a 3.25 million tons per year refinery at Mersin for the Turkish government. In Punjab, another joint British-American venture complet-

Solve Small Space Heating Problems with Suburban Novent-Dynavent GAS Heaters

Heat by the roomful...that's what you get when you specify Suburban Novent or Dynavent Gas heaters. No need to heat unused or unoccupied rooms. No flue or chimney needed. Ideal for added rooms, cabins, playrooms, closed-in breezeways, offices and garage workshops.

Suburban Novent and Dynavent Gas heaters give you all the advantages of modern gas heat . . . high efficiency, precise control, speed, cleanliness, economy and dependability of supply. Gas can be the answer to your unusual or everyday heating problems.

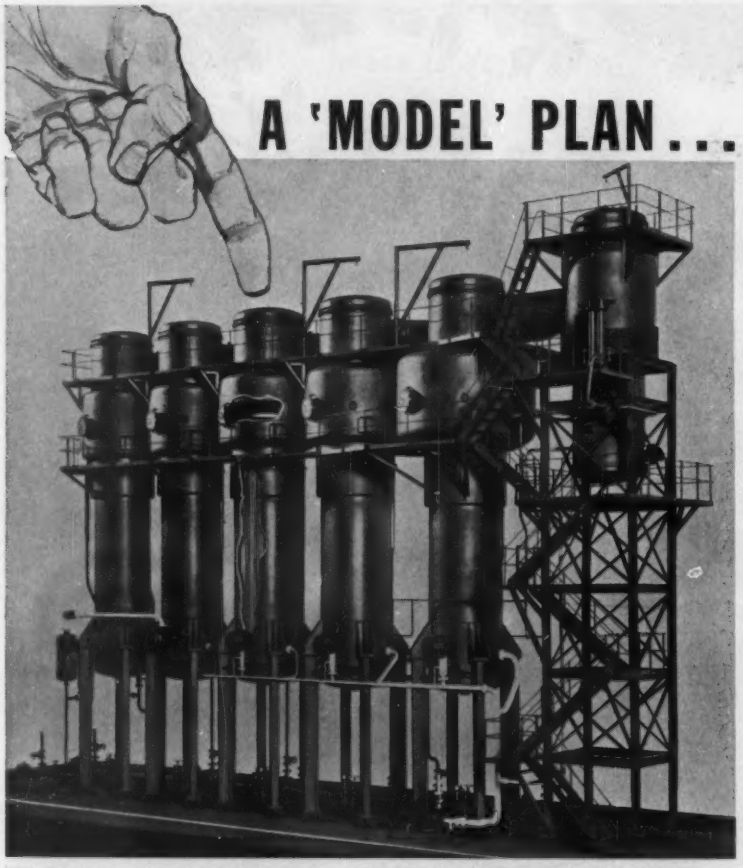


Heat better for less with Suburban Novent or Dynavent Gas heaters. For complete information, contact your local Gas Company, or write to Suburban Appliance Co., Dept. CE 1061 Morristown, New Jersey.

American Gas Association

Right: These units are installed at the Price Apartments, Nutley, New Jersey (shown above). Each apartment is individually heated to exactly the temperature desired by the occupants.

FOR HEATING... GAS IS GOOD BUSINESS!



FOR LOWER OPERATIONAL AND MAINTENANCE COSTS

The illustrated scale model represents the heart of a plan to save you money—a Swenson designed Long Tube Vertical Evaporator.

Take a moment, if you will, and examine the illustration. Note the accessibility of major components for easy inspection and maintenance and the relative simplicity of the overall arrangement. Every control is in the open, easy to get to. Every inch of vapor piping laid out so that anyone can follow the pattern.

The balance of our plan consists of pre-installation consultation and post-installation service. Swenson engineers, with extensive practical experience in evaporation equipment design, can put a 'model' plan in effect for you. Just write or phone.

FREE: Technical bulletin on cleaning and maintenance of Long Tube Vertical Evaporators. Written by Swenson engineers to provide information you can use. Write for your copy to: Swenson Evaporator Company, 15620 Lathrop Ave., Harvey, Illinois. In Canada: Whiting Corporation (Canada) Ltd., 350 Alexander Street, Welland, Ontario, Canada.

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ed a 200-mile natural gas line from the Sui gas fields to Multan. A strictly British venture furnished prefabricated textile mills for Iran and Sudan, and in India, United Kingdom firms assisted in design and construction of the Orient's largest fertilizer plant for the Sindri Fertilizer Company. A combined venture of several British firms currently is constructing an iron and steel foundry at Durgapur, West Bengal; and the 3.5 million pound Aviles iron and steel plant on the north coast of Spain was British designed and built. Burma boasts a completely new pharmaceutical plant which was equipped and installed by a British drug firm. At present, a United Kingdom firm is at work in upper Ontario, Canada, constructing the new Blind River thorium extraction plant.

Airports

British engineers have had their share of overseas airport contracts, including construction of the Dar es Salaam Airport (Tanganyika), and the Nadi International Airport (Fiji); supervision of reconstruction of the Amman and Jerusalem Airports; and recent improvements and additions to Malay, Singapore, Hong Kong, Nigeria, Northern Rhodesia, and Jamaica airports. The Beirut Airport, currently under construction, was a joint British-American design project, and the newest British project is the Baghdad International Airport.

Nuclear Power

In the field of nucleonics, a British firm bagged the world's first full scale export nuclear power plant, which will be located near Rome, Italy. In West Germany, Denmark, and Australia, research nuclear reactors will be furnished by British firms. The United Kingdom Atomic Energy Authority has furnished the fuel charges for the boiling water reactor at Halden, Norway, and India's first reactor facility, at Trombay, near Bombay. ▲▲

WHISPERING GLADE...OR ECHOING CANYON?

It will depend upon many factors and certainly one of them will be the sound or communications system you specify. Here are some of the reasons why the best sound and communications systems bear the name STROMBERG-CARLSON.® ■ All of the components that will be used in any STROMBERG-CARLSON system you specify are custom-matched ... designed right from the beginning to work together to minimize engineering and installation time ... to provide any building with the finest total system results. ■ Field and factory technical assistance will be readily available to you and your staff ... anytime ... any place. ■ You'll rest confidently in your choice because a system with the name STROMBERG-CARLSON is a system backed by more than 60 years of unsurpassed competence in sound engineering. ■ Want more details, data sheets or do you have specific questions? Write to Commercial Products Div., Box C, 1410 North Goodman St., Rochester 1, N.Y.

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Hampshire) • Manchester, N.H.
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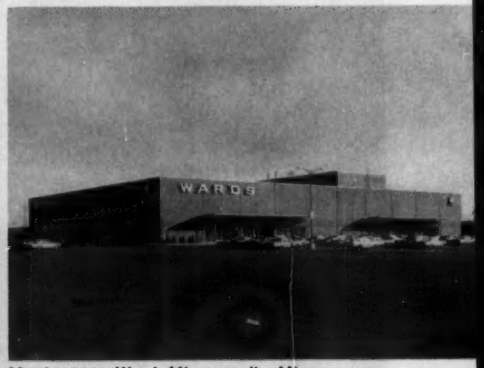
Wisconsin Southern Gas Co., Inc.
Lake Geneva, Wisc.
California Interstate
Carson City, Nevada
Toll Road Service Area—Near Ohio Line,
Ohio Turnpike • Lorain, Ohio
KVOO-TV • Tulsa, Oklahoma
Troy Elementary School • Troy, Pa.
Chambersburg High School
Chambersburg, Pa.
Sioux Falls School (Axtell Park Jr. H.S.)
Sioux Falls, S. Dak.
St. Lukes Elementary School • Erie, Pa.
Pure Oil Station • Cable, Minn.
Wold Chamberlain Field
Minneapolis, Minn.
Police Bldg. • Lexington, Mass.
Barrington Town Hall • Barrington, R.I.
Radio Station WGL • Ft. Wayne, Indiana
Southeast Colorado Power Assn.
La Junta, Colo.
Radio Station WPBC
Minneapolis, Minn.
Radio Station WBRY • Waterbury, Conn.
Radio Station KSTL • St. Louis, Mo.
Fire Station • Minneapolis, Minn.
Sewage Disposal
Columbia Heights, Minn.

First Federal Savings & Loan, La Crosse, Wisc.

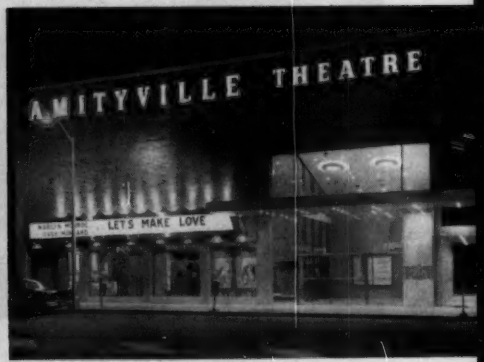
Las Vegas Convention Center

Central & Southern Florida Flood Control District



Montgomery Ward, Minneapolis, Minn.

Phillips Restaurant Lounge, Ft. Lauderdale, Fla.



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Farm Bureau Mutual Insurance, Concord, N.H.

Shadowbrook Jesuit Noviate, Lenox, Mass.

so many standby power problems

Call in your Onan representative for suggestions on type of fuel, cooling system and other options

Yours is the essential judgement in determining the practicality of standby electric power in buildings you plan or modernize. When, in your judgement, standby is a consideration, we hope you'll call in your local Onan man early in your planning. Fulltime specialists in this field, you'll find their experience helpful in deciding how much critical power insurance is needed. Often, you'll be surprised *how little* emergency power they'll recommend.

An Onan specialist will work closely with you, without obligation, to determine *where* in the building a standby plant should be located, the most efficient cooling system, the most inexpensive fuel system, and all other options.

They'll help select—and supply—all necessary accessories including line transfer control and fuel lines and tanks. *Only Onan offers this complete one source responsibility.*

Bear in mind, too, that local factory service and parts availability is another important plus when you specify Onan. More than one hundred authorized Onan distributors are located in major cities, coast to coast.

Onan plants, gasoline, gas or diesel driven, are now available in sizes to 230 kw. Your local Onan distributor is listed in the Yellow Pages.

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We certify that when properly installed and operated this Onan electric plant will deliver the full power and the voltage and frequency regulation promised by its nameplate and published specifications. This plant has undergone several hours of running-in and testing under realistic load conditions, in accordance with procedures certified by an independent testing laboratory.

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The Readers' Guide

The British Approach
page 77

Though Britannia may no longer rule the waves, her consulting engineers are still playing a vital role in the economic development of emerging nations. The history of British consulting engineers abroad is long, proud, and a distinct challenge to U.S. consultants.

Government in Engineering
page 88

The rapid growth of consulting engineering firms in recent years has tended to obscure, for some at least, the equally rapid growth of government engineering. As yet, government policy toward the provision of engineering services has not been established. It is still a matter of individual government officials' judgment; and their opinions vary widely. Nevertheless, it is vitally important that consulting engineers present a united front in their efforts to turn back the noticeable trend toward "socialization" of engineering design services. In this issue, CONSULTING ENGINEER editorializes on the problem, and then illustrates some of its many facets with articles from consulting engineers themselves and from important men in several Federal government departments.

Water . . . Everywhere?
page 105

As a companion piece to last September's staff report on sewage treatment, this month's report on water points up the fact that, when local political units fail to act in a responsible manner, the Federal government steps in. It is about time that American suburbia woke up and realized that it is drinking its own sewage effluent. The individual home owner's private well may be a marvel of modern engineering, but the quality of its water often is much lower than that delivered by yesterday's long handled pump. Consulting engineers could perform no greater service for the public health, safety, and welfare than to lead the battle for centralized water supply systems.

Engineering Headquaters
page 63

The United Engineering Center, just next door to the United Nations complex, is a welcome contrast to the dingy quarters formerly occupied by the engineering societies. In a walking tour from rooftop to basement, CONSULTING ENGINEER's Eastern Editor was confronted with the obvious fact that some of the engineering societies were either financially or esthetically unable to live up to the artistic standards of the new building. However, the clashing decors are mercifully hidden from the visitor to a specific floor.

Hawaiian Consultants
page 71

Hawaii's building boom may be close kin to the good old Florida land rush of several years ago. It is a fertile area for consulting engineers, and though local firms are growing in stature, many mainland firms are finding a growing need for their engineering services.

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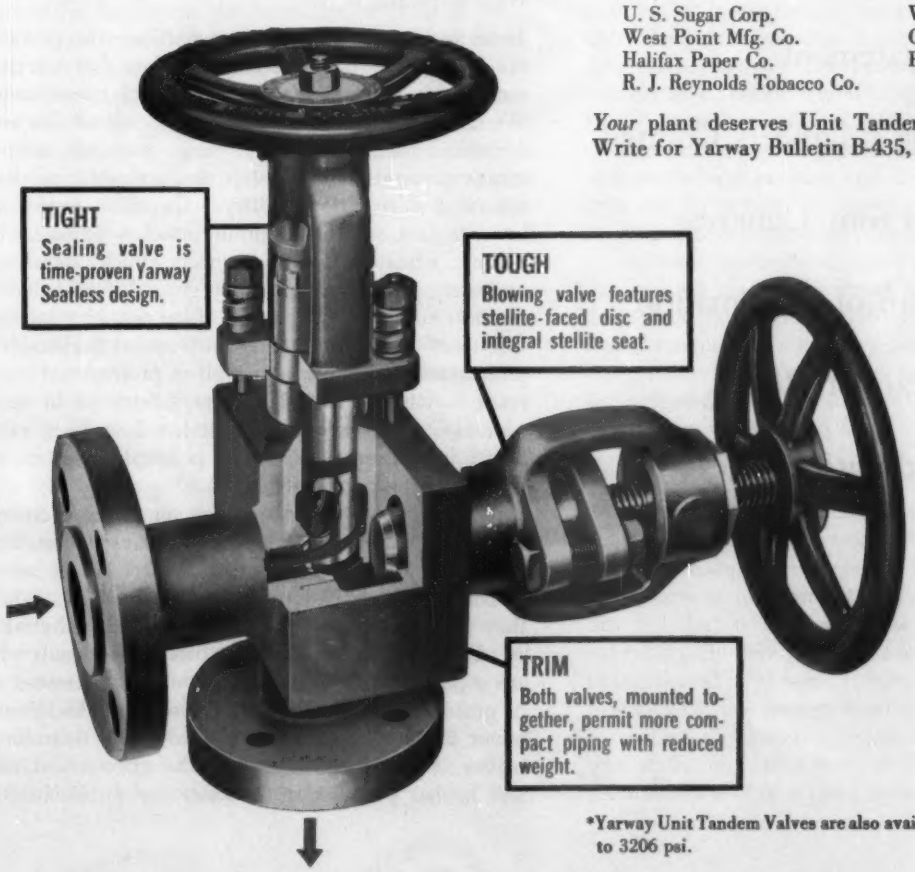
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Government

Consulting Engineer Report

Editors' Statement

Consulting Engineers Council

Opinion From Congress

The Bureau of Reclamation

The Bureau of Roads

Health, Education, Welfare

C£ exclusive

TRADITIONALLY, goods and services in the United States have come from the private sector of our economy. That any at all are provided by government, except from such institutions as the armed forces and the post office, is a concept born and nurtured in the depression. Unfortunately, this concept was nurtured too well. We have learned to accept a great deal from government, and some of us are expecting even more.

Up to this point, those in government who believe in expanding its areas of activity have made their greatest inroads in the field of services — insurance, utilities, medicine, and engineering. The government has not yet made any major inroads on the production of goods. U. S. Steel is not yet U. S. Government Steel.

What Socialism Is Not

In terms of classic economic definitions, the promoters of big government chose well when they selected services as an expandable function of government. We have heard a great deal about socialized this and socialized that, but to the purist, socialism simply means government ownership of the nation's production and distribution facilities. On these terms we have, in fact, socialized nothing much — so far.

Thus, when consulting engineers attack "socialized engineering" they are on shaky ground, for engineering falls in the grab bag sector of our economy labeled "services." It lumps together professional barbers and professional barristers — as well as professional engineers — without regard for the differences in their education and function. And it has long been neglected by the economists and political scientists, as well as by the public in general.

In recent years, this services sector of our economy has come under closer scrutiny because consumers are spending more money in it and because it seems to combine high costs and low productivity. While they may not be contributing to this unhealthy state of affairs, it is obvious that the true professionals who are a part of this group had better get interested in its problems. If they do not, they soon may find themselves living with policies established by their local barber. After all, he is licensed by government too, and he has promised to promote the public health,

In Engineering

A Statement By The Editors . . .

safety, and welfare — even if it involves only an attempt to control the spread of dandruff.

Consulting engineers and their fellow professionals must lead the way in getting services properly established in the private rather than the public sector of our economy. Certainly, the concepts of capitalism have enabled the United States to become the wealthiest nation in the world in terms of goods. It is, therefore, reasonable to expect that these same concepts can make us the wealthiest in terms of service.

If consulting engineers and other professionals believe that this is so, they must stand on this principle. Even though they believe they can provide better and cheaper services as private individuals than as government employees, the first round in the battle should not be fought on these grounds. Rather, it should be fought on the fundamental principle that the United States is a great nation because it believes that the greatest good for the greatest number can be achieved only through individual freedom under limited control. No nation has yet proved otherwise.

This, then, is where we stand: We must establish long term government policy toward the services sector of our economy — particularly as it involves the professional engineer in private practice.

Government Policy Is Still Fluid

Contrary to the belief of some consulting engineers, there has been no firm policy established for the role of government in the area of engineering services. It is probably true that Washington has staked out a smaller claim than some states — notably California. In fact, the degree to which government is providing services to the public has been left largely to individuals. As far as engineering design is concerned, policies vary widely. In some states, highway design is delegated to the state highway departments by law. The engineer in private practice has no entree. In others, much of the work is left to consulting engineers, with the state highway department limiting its activities to long term planning, routine design, and the establishment of suitable standards.

On the Federal level, government policy is set individually by the various departments. Three articles from three different departments appear in this issue of CONSULTING ENGINEER. Essentially, each portrays a different attitude toward the question of whether the service of engineering design should come from private business or from government. The three departments display these distinct approaches:

¶ Engineering design is part and parcel of over-all government planning. If at all possible, engineers in private practice should not be used. The work should be done by employees of the Federal government.

¶ Over-all planning and guidance are functions of the Federal government, but design engineering should be handled by the states, with private firms used to handle abnormal work loads or special projects for which state employees are not qualified.

¶ Over-all planning and guidance are functions of the Federal government, but the states should participate so that local needs are properly considered. However, design engineering should be left to engineers in private practice. The Federal government's only interest in a specific engineering design is to be sure that it promotes public health, safety, and welfare.

There are many variations on these themes in the various Federal bureaus and departments. However, they are, up to now, the expression of personal points of view — not expressions of government policy.

Currently, government agencies are faced with new demands on their engineering and technical staffs as a result of the defense build-up and expanded public works programs. Preliminary manpower studies, now being made, indicate that they may be forced to resort to increased contract services with private professionals and professional firms.

The Washington Manpower Studies

The House Manpower Subcommittee, under Chairman James C. Davis, Democrat, Georgia, now is winding up a comprehensive study of manpower utilization practices and projections. A report is expected this fall, but recommendations are still under consideration. However, an advance scanning of information gathered by this committee, while shaping appropriations for the current fiscal year's operations, indicates that the major agencies still depend on their own staffs. But since most of the officials concerned gave their views or reports before the Berlin situation

became critical, these views may be altered. This, in spite of the President's hope that new demands can be met with existing government engineering staffs.

The Navy, as a service with large engineering and technical demands, always has had a high appreciation of what is termed "in-house" capability. In spite of the complexities of modern weapons development, its basic approach is still to build its own capability to operate and maintain its equipment at sea, and to maintain or modify it ashore.

However, Navy spokesmen have conceded, in their conferences with manpower surveyors, that increasingly involved technologies are making a broad adherence to this plan extremely difficult. Thus, one Navy spokesman has stated that, "We will probably never be able to eliminate the use of contract engineering services altogether."

On the other hand, there is a disposition in both Navy and some other defense establishments to reabsorb former uniformed personnel as civilians in what are essentially civilian posts. Occasionally, these men simply have taken positions as civilians which they occupied while in the service, but others have filled new positions.

Of the strictly civilian government engineering activities, the Interior Department has one of the largest. The Bureau of Reclamation, the National Park Service, and the Indian Bureau are typical of the department's units in which large-scale engineering is a function. Reclamation, for instance, has had up to 1600 engineers in its Western Division, and currently is reported to have around 1200.

The National Park Service has occasionally contracted for engineering services in "crash" programs, but it, too, attempts to provide its own engineering services for its own projects.

Fairly extensive engineering services are required by the Interior's Bureau of Indian Affairs, particularly for school construction and utility work. In the past, it has used private engineering firms for such work rather frequently, but this practice is tending to decrease, partly as a result of a study made at the direction of Secretary of Interior Udall earlier this year. A task force designated by the Secretary reviewed the Bureau's requirements in detail, and recommended that more work be done by its own engineering employees. While there has been no formal action on this recommendation, the Bureau — in subsequent engineering operations — has informally followed the suggestion, and it is expected that this policy will continue to apply. Whether such action will have broad application to the Interior's engineering undertakings has not been indicated.

During hearings on Bureau of Reclamation appropriations for the new fiscal year, House Appropriation Committee members displayed much interest in certain engineering costs of the Bureau. It developed that engineering designs, specifications, and supervision of construction ran from 6 to 10 percent of total construction cost. Added to this is a figure of 2½ percent of construction cost for preliminary design, resulting in a cost range of 8½ to 12½ percent for these activities.

One House member suggested that "12½ percent is a very high fee for engineering." A department witness answered, however, that the figure was not high "for the kind of engineering that the Bureau of Reclamation historically has performed and will continue to perform." The committee member replied that "a normal engineering fee is roughly in the neighborhood of 5 to 6 percent."

Too Many Engineers in Government

Whether engineering services will remain in the private sector of our economy is still open to question. However, CONSULTING ENGINEER believes that there already are too many engineers in government employ — and there probably will be more.

Here are the statistics on the Federal level:

¶ Although only 3 percent of the total labor force works for the Federal government, 6 percent of all registered engineers work for Federal agencies.

¶ After a slight decline from 1951 to 1954, engineering employment in the Federal government rose 4 percent from 1954 to 1957; 8.5 percent from 1957 to 1958.

¶ By 1963 it is expected that 65,550 engineers will be employed by the Federal government — an increase of 19.5 percent over 1958.

¶ 90 percent of all engineers in the Federal government are concentrated in the Departments of Agriculture; Commerce; Interior; Air Force; Navy; Army; and Health, Education, and Welfare; and in the Atomic Energy Commissios; National Aeronautics and Space Administration; and Veterans Administration.

And on the state government level:

¶ More than 41,000 "engineers and scientists" are employed by the state governments. Over half of these are civil engineers, and 93 percent of this group are employed on highway and public works projects. However, it should be noted that only 56 percent of the engineers in highway departments have bachelor's or higher degrees, although 88 percent of the engineers in health and welfare agencies hold degrees.

And on other government levels:

¶ The total number of engineers employed by cities and other governmental units is unknown. That it must be large is indicated by the fact that 16 percent of the 4689 employees of the Port of New York are technical or professional people — primarily engineers.

These are impressive figures, and, to those of us who favor the traditional concepts of American free enterprise, they are rather frightening. As Shakespeare so aptly put it:

"When the fox hath once got in his nose,
He'll soon find means to make the body follow."

Government in Engineering

CEC Approach

Excerpts from
Consulting Engineers Council
Statement by Harold King
to the Subcommittee
for Special Investigation
of the House Committee
on Armed Services

We believe that there are distinct advantages to our government, and therefore the public, in the use of services provided by engineers in private practice by government agencies. Briefly, these advantages may be listed as follows:

¶ Affirmation of the principles of private enterprise, which are implicit in the concepts of sound economy under a democratic form of government

From time to time we must all reaffirm our belief in the principle of private enterprise . . . We are very much concerned that if the philosophy of using engineers in private practice is eliminated by government agencies, it will lead to a complete destruction of an important segment of the private enterprise system. Remember, when government competes with private business, it foreshadows the eventual denial of the right of its citizens to engage in business. We do not wish to infer that this principle applies to engineers only, but that it should be the guide for our government in the procurement of all services . . .

¶ Greater national security through build-up and strengthening of a pool of highly qualified specialists whose services are available in times of emergency

The use of [engineers in private practice] by our government can provide a very important reservoir of engineering talent. The Armed Forces can become acquainted with the particular qualifications of various firms and thereby have ready an engineering force to call upon at a time of a major emergency. This has been necessary twice in the last two decades. During World War II and the Korean Conflict, the engineering profession has provided the know-how in both the military and civilian fields. This . . . can be a very important part of our national defense. We believe strongly that if this reservoir of scientific and engineering talent is destroyed by . . . nonuse . . . the nation will be the ultimate loser. The established government staffs never have been and never will be of sufficient size to cope with major emergencies,

unless the "State" is substituted for private enterprise. This, we are sure, is not your desire, nor is it ours.

¶ Opportunities for selecting specialists whose unusual skills, knowledge, and experience would not otherwise be available to public agencies.

Consulting engineers in private practice can be selected whose qualifications are particularly suited to a specific project. The present method in use by the Armed Forces – obtaining professional services by interview and negotiations – provides an opportunity for the selection of a properly qualified firm. Consulting engineers approve of this method and believe that it is in the public interest, for it provides the best possible results for the least cost . . . An engineering staff tends to reflect the ability and ingenuity of the men who are at its head. Private engineering firms can stay in business only if they are receptive to new ideas and more economical methods of providing quality service. However, it seems that, in general, the competitive challenge to adopt new concepts does not exist in many government engineering staffs. The consulting engineer practices his profession over a wide and varied field, and will . . . apply new ideas, innovations, and techniques to projects he designs.

As you well know, sudden adjustments in Civil Service staffs to obtain particular skills, knowledge, or experience for a specific project are neither practicable nor probable.

¶ Greater alertness to effective prosecution of the work in compliance with time schedules

Consulting engineers in private practice are accustomed to executing work under pressure and thereby complying with time schedules specified in contracts. Seldom do planning and design projects run behind time limits as long as the scope of the project is not materially changed. Government staffs may often have projects delayed by other projects assigned a higher priority. Often this predicament cannot be avoided and, if the staff is already working to capacity, a serious delay may result. The consulting engineer works under a very rigid contract, prepared by the government, which stipulates, very definitely, the time limit. Therefore, the retaining of consulting engineers reduces the possibility of delay to the minimum.

¶ A deterrent to overexpansion of governmental departments, thus minimizing "empire building"

There is a growing and continuing tendency for government agencies to increase their engineering staffs. Much of this is the result of sudden expansion to handle specific problems or temporary peak demands. The services of engineers in private practice can be utilized to great advantage in these instances, and the judicious use of consulting engineers will be a deterrent to overexpansion of government staffs. This is sometimes referred to as "empire building," and must be discouraged in the interest of economy . . .

¶ True and complete records of engineering costs allocable to specific projects, in an improved accounting system that would serve the interests of sound administrative procedures

Often engineers in private practice are called upon to prove that the cost of consulting engineering services is more economical than the same services provided by government forces. We know the cost of our services is less, but we find ourselves at a great disadvantage . . . because of the unrealistic accounting system of our government. It is deplorable that our government insists that private business maintain financial records from which we can submit an accurate and realistic cost for doing business, but it does not have an accounting system which indicates the true and complete cost of providing its engineering services. It is questioned, in published data by government agencies regarding cost of engineering services, whether nonproductive time or items paid out of unallocated funds are included, such as cost and maintenance of buildings and utilities. These are certainly overhead costs and, to make a true and honest comparison with private business, must be included since they are a cost to the taxpayer.

Government cost information, in its entirety, is not available to us, but it is to you gentlemen, and we recommend that you investigate this matter to assure yourselves that all costs for services are included before making a comparison with fees paid to consulting engineers. We believe that the cost accounting system of the government should be revised so that it will be a fully reliable basis for examining costs of engineering work performed by government staffs. We believe further that the private practice of engineering, or any other private enterprise, should not be subject to price competition by government activity.

¶ Economies in the handling of engineering in Federal programs, particularly for increased work loads occasioned by programs of an emergency nature, and projects of unusual character or magnitude

It is the Council's contention that definite economies can be realized in the engineering design of government projects by consulting engineers – particularly those where it is deemed necssary to suddenly augment government staffs to care for increased work loads occasioned by emergency programs of unusual nature or size. Reduction of Civil Service staffs seldom occurs, if ever. Staffs not kept busy to maximum efficiency are very costly and should be avoided. We believe that every owner or client is entitled to the highest possible return on money spent for engineering services. On government work the taxpayer is the owner and, in essence, the client, and therefore he should be accorded the same consideration.

We believe that properly manned government engineering staffs must be maintained at a level to provide certain services.

The Coordinating Committee...

JAMES P. EXUM
Consulting Engineer

ABOUT two years ago, consulting engineers, and the government agencies retaining them, were subjected to a frightening amount of uninformed criticism – individually and collectively. We have not moved any worlds yet, but I do think consultants have made a good beginning on a positive approach to this problem. The best thing was the formation of the Coordinating Committee for Relations of Engineers in Private Practice with Government.

In early 1960, representatives of the American Institute of Consulting Engineers, the Consulting Engineers Council, the National Society of Professional Engineers, the Engineering Division of the American Road Builders' Association, and the American Society of Civil Engineers met to discuss the problem created by expanding government engineering departments, which were doing work that should have been done by private consultants. The American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Institute of Architects were asked to join the group but declined, perhaps understandably, because at that time most of the criticism involved consultants connected with highway work. Engineers Joint Council did not join, but they did appoint an observer.

Our first step was to hold off-the-record meetings with heads of the various Federal departments to discuss their policies on the use of engineers in private practice. Then the Coordinating Committee drafted a Position Paper on the use of consultants by government agencies (see page 134).

If we have accomplished nothing else, at least we are working together. In these days of lip service to unity, the continued cooperation of five national organizations is unusual. Through this cooperation, we are eliminating duplication. Also, we now are in a position to go to government officials with one story, instead of dropping in individually with conflicting positions.

This month, the Coordinating Committee plans to hold a meeting to map future strategy. We plan to:

¶ Use the Position Paper. However, just how and where to use it remains to be decided.

¶ Finish compiling a bibliography of statistics and articles on the consulting profession. After all, many government agencies would like to use consultants, and I think an important part of the Coordinating Committee's job is to provide material which these officials can use to sell the consulting profession.

¶ Prepare recommended procedures for retaining consulting engineers, for distribution to interested state and Federal agencies.

Government officials are not going to carry the torch for the consulting profession. Their job is to provide the best possible construction at the lowest total cost to the taxpayer. This can be done through the use of consulting engineers, and it is up to us to see to it that the taxpayer is properly informed of this fact.

Government in Engineering

One Congressman's Opinion

Gordon H. Scherer has been the Representative from the First District of Ohio for the past nine years. Scherer, a Republican, practiced law in Cincinnati before entering politics. He is a member of the Un-American Activities, Public Works, and so-called "Blatnik" Committees.

OHIO CONGRESSMAN Gordon H. Scherer, who has become well known in the engineering profession for his out-spoken backing of private enterprise in general and consulting engineers in particular, took a look at the 87th Congress for CONSULTING ENGINEER.

"One of the few victories for private enterprise during this session was the defeat in the House of the so-called Hanford Reactor Section of the Atomic Energy Authorization Bill," Scherer began. "This provision, while rejected by the House, was approved by the Senate. Its fate still must be determined by a House-Senate Conference. It would provide $95 million for installation of electric power generating facilities by the AEC. In connection with the production of plutonium, nearly 800,000 kilowatts of electricity would be generated. The government would be in the power business in a big way.

"When the original Hanford plutonium plant was authorized in 1957, members of Congress were assured that this AEC project would be limited to the production of plutonium. The proposed electric energy producing facility will not add one iota to nuclear technology. The evidence is clear that this additional electric power in the Northwest is not needed and that existing private utilities are capable of meeting the demand of this area now and in the future. The vigorous way in which the public power boys are fighting for this authorization would lead one to think that electric energy can be stockpiled. Actually, it is the old story of whether our electric power should be provided by government or by private enterprise. Government-produced power is subsidized by the taxpayer, while privately produced power carries part of the tax burden necessary to operate this country."

Following TVA Pattern

Scherer compared the current attempt to produce power as a by-product of nuclear energy with the history of public power in the Tennessee Valley. "TVA began providing power as a by-product of flood control projects. Today, the production of electricity by this government-owned agency is its primary and biggest business. More than 50 percent of TVA's total power output comes from steam plants."

In a speech before the House, opposing the granting of bond-issuing authority to TVA for increasing its power producing capacity, Scherer said:

"As soon as TVA gets this bond-issuing authority, you are going to have a rash of bills that would permit every other government power agency over the United States to do the same thing. In fact, the Senate has just completed hearings on a bill to create a planning, financing, power-generating, and power-transmitting corporation to absorb the Bonneville Power Administration. Under the bill, the Bonneville power corporation would be authorized to issue bonds to the treasury up to $1.1 billion, to finance electrical generating and transmission facilities.

"Today, TVA proponents are willing to accede to certain territorial limitations on TVA because they know it will take a few years to build the facilities necessary to meet the current power demands of the industries that TVA has pirated from your state and mine into its present service area. But once these

demands have been satisfied, it will reach out like an octopus and gradually grab more and more territory."

The Foot in the Door

In denouncing the continued astronomical spending of the Federal government, Scherer noted that a number of "get the government out of business" bills have been introduced this year. None ever got out of committee – principally because of public apathy.

"I do not think the average businessman realizes the extent to which he is in competition with government. I support any measure which gets the government out of what is entirely private enterprise. It has been demonstrated time and time again that any function or activity handled by government is done less efficiently and is more costly than if it were left in the hands of private enterprise.

"Yet, government spending constantly is being increased by literally hundreds of new programs which Washington is taking on. For example, just a few years ago, the Federal government began an entirely new grant-in-aid program, by giving Federal monies for the first time to municipalities in order to pay 30 percent of the cost of constructing sewage disposal facilities.

"Under this legislation, we did build more sewage treatment plants, but it was not the Federal contributions that did it. It was the teeth that we put into much stricter enforcement provisions in the law that did the job. In fact, contributions retarded rather than encouraged construction of urgently needed disposal plants. Cities and villages began dragging their feet and getting in line for their Federal handouts, rather than going ahead under their own financing plans."

Taxes

"Like any taxpayer, and like any elected official, I am against higher taxes. But with the way government spending is snowballing, taxes also must rise if we have any sense of fiscal responsibility whatsoever. More deficit spending, without more income, will set the inflationary spiral into motion again.

"In these perilous times, which require a substantial defense buildup, a congressman cannot cut Defense Department requests without being accused of playing fast and loose with the security of the nation. We all know that there is waste and inefficiency in the Defense Department; but it is difficult, if not impossible, to put your finger on it. As to the need for this highly intricate and complex defense program, we must rely on the recommendations of the military and other experts. I personally believe that we could have just as much defense for 20 percent less money."

Congress and Consultants

A member of the minority group on the Blatnik investigating subcommittee, Scherer thinks consulting engineers have made an excellent showing. "In the hearings to date, there has been little said or developed about shortcomings of consulting engineers. In fact, most deficiencies in the highway construction program that have been disclosed to date can be traced to a few contractors and personnel in some of the state highway departments. I would not want what I have said, however, to mean that all future findings will follow this exact pattern.

"Any profession or business has its bad apples, but it has been my observation that the engineering profession has, by comparison, fewer than all others. By the same token, what I have said is not a blanket criticism of state highway departments. On the contrary, I happen to know that the great majority, particularly in the engineering divisions of our state highway departments, are honest, competent, and dedicated individuals, often working under handicaps.

"In future hearings, perhaps even later this year, I expect consulting engineers to get some attention. I think it would be to their benefit and that of the public highway construction program to have an impartial study made on comparative costs of their work and that of government design departments. As you know, the charge has been made that the cost of engineering services of private consultants for these new highways has been excessive. I do not doubt that you are going to find some instances in a program of this size where engineering costs have been out of line, but in comparison with the total program, these instances are going to be few and far between.

"Some of the bureaucrats and professional planners want to build up state highway departments so that they can perform all of the engineering work during the remainder of this highway program. State highway departments, however, should be manned only with sufficient strength to do basic engineering and to supervise and direct this mammoth highway program – and then maintain it. They should not become oversized engineering bureaucracies.

"As we all know, there are peaks and valleys of activity in this business. If we build up our government engineering departments to meet the peak loads, total engineering costs will be excessive, because of the necessity of maintaining oversized organizations during the valleys. Again, we must remember that government agencies pay no taxes."

Mentioning the new proposed programs to aid South American development, Scherer added that it will require considerable engineering skills and services. "I hope this will be done on a contract basis, using our engineering talent from private practice."

He concluded with the suggestion that consulting engineers, when confronted with what they consider unfair competition from a government agency, send documented data to their representatives. "We cannot help solve a problem we do not know about."

Government in Engineering

The Bureau of Reclamation

Floyd E. Dominy was appointed Commissioner of the Bureau of Reclamation by President Eisenhower, and was reappointed to the post by President Kennedy. Dominy joined the Bureau of Reclamation in 1946, after two years of duty with the Navy. He became Assistant Commissioner in 1957, Commissioner in 1959.

As COMMISSIONER of the Bureau of Reclamation and as an administrator – particularly as a nonengineer – I believe I am qualified to speak objectively on why the Bureau should retain engineers for the design of Reclamation projects.

To the press and within our own organization, we use the term "Bureau Engineers." What we mean is the Bureau's technical talent, a large part of which consists of registered career engineers. In addition, we have chemists, soil scientists, economists, accountants, geologists, agronomists, physicists, and petrographers. Many of these are also registered or have some tangible recognition attesting to their competence. Their professional activities and renown bring much credit to the Bureau.

When we refer to our work as a Reclamation project, it means the development of a geographic area through the construction of interrelated features such as a dam and reservoir, a canal system, or a transmission system and its associated structures. The Bureau is confined in its operation to Alaska and the 17 states west of the Red River.

Like private consulting engineers, the Bureau also has clients: farmers, ranchers, and private businessmen who are potential water users. They come to the Bureau of Reclamation for three principal reasons:

¶ Federal financial assistance may be required.

¶ Our experience and technical competence in this field may best qualify us to undertake the work.

¶ A project may be beyond their ability to fully plan and coordinate with other associated projects to achieve full river basin development, because of its size or other circumstances.

Our clients may advance money to finance a part of the cost of the engineering, planning, and investigation. However, if Congress approves the request of the Bureau for planning funds to undertake the work, it authorizes the use of money which generally comes from the Reclamation fund that was set up under the basic authorizing legislation for such purposes. The investigation then would proceed to measure the potentialities of the water resources, determine how the development of the area would fit into an over-all basin plan, and assess the economic value of the potential reclamation project.

To make full use of the potentialities of any geographic area, we must assure availability of sufficient water, a place to store it, and land suitable for its application for agricultural purposes. This may be for truck or specialty crops, orchards, forage for livestock, or other nonsurplus agricultural products. If we are fortunate, we may find that there is a possibility of producing power economically.

Should a reconnaissance investigation of the potential project prove favorable, the Bureau technical team then performs on-site coordinated investigation of the hydrologic, geologic, engineering, and economic feasibility. Additional basic data are accumulated and analyzed by our engineers, agriculturists, economists, soil scientists, and other technical experts. Included

in this study are preliminary plans; layouts of dams, canals and lateral systems, and principal structures; power plants and related facilities; economic evaluations; and a method of coordinated operation for the entire project. By this time, a good over-all concept of the project is established and a sizable portion of the engineering and economic work, perhaps a third, has been accomplished. This is to determine whether a project is economically feasible and whether our clients, as prospective water users, could and would be willing and able to undertake repayment of Federal costs to the government.

The joint efforts of these teams culminate in a report. As required by the Acts of Congress, this report is appraised by local, state, and Federal agencies, each of which has a specific interest. The report also is available for public scrutiny, and is frequently supplemented and revised to satisfy groups (among which are private groups with special interests in fishing, recreation, and maintenance of historical sites). After formal review by affected states and other Federal agencies, the report is further reviewed by the Bureau of the Budget. It then is submitted to the Congress for consideration. If there is strong local support for the project and an indicated willingness to undertake the repayment obligation, the Congress may authorize the project for construction. A second scrutiny is provided by Congress, in that the Appropriation Committee must satisfy itself that the work can be financed within the current and long range Federal budget.

The Bureau's Requirements

Should the Bureau's investigations, as represented by a project planning report, be satisfactory to Federal and state agencies and to Congress, appropriations then are made available to commence the public work. There are certain legal and administrative requirements, however, that must be met. These prerequisites, which are not normally encountered in private engineering work for private clients, account for administrative and engineering costs which tend to distort cost comparisons. For example:

¶ We must have in our hands, and so advise Congress, a certification that the area to be irrigated is suitable for the production of crops.

¶ We must have a repayment contract with the beneficiaries who obligate themselves to repay their assigned portion of the costs, and this contract must have been processed through court and proved valid.

¶ Assurance must be obtained that existing water rights have not been endangered and that all the necessary water rights have been acquired.

¶ Flood regulations must be properly coordinated and approved by the Corps of Engineers.

¶ Clearance must be obtained from other Federal agencies to make certain that articles of historical significance, such as dinosaur bones, old forts, Indian mounds, and artifacts, are not destroyed.

As soon as Congress approves a project and money is available to start construction, our engineers move back to the job site and start intensive investigation to accumulate detailed design data consistent with the plan approved by the Congress. Final designs and specifications then are prepared.

Order of Work

Usually a project will require 5 to 10 years to bring to completion. Therefore, work usually is begun first on components requiring longer construction periods, such as the dam and reservoir facilities. Construction of the associated canals and other structures is coordinated with the completion of these facilities. Therefore, the design load in our Denver office is picked up first by those engaged in the design of such items as dams and outlet works. Later, the work load progressively moves to our engineers who are proficient in the design of the associated structures. The normal sequence results in phasing of the design work to permit its being handled by a relatively small, balanced staff on the basis of a reasonable work load.

Concurrently with the preparation of structural designs, work is carried on in the writing of the technical portions of our specifications. Combined with these are the nontechnical requirements, including many contract provisions which are peculiar to all Federal agencies — requirements for safety, labor standards provisions which we are required to enforce, nondiscrimination, contingent fees, small business, disputes, collusive bidding, labor surplus areas, and consideration of bids for and use of foreign materials. Also, as the designs are being prepared and as the specifications are being written, the laboratory frequently is required to run model studies. Our scientists and laboratory experts work closely with our designers on specific problems, and while most of the costs are charged to the project at hand, the benefits of the work are applicable to future Reclamation projects and are made available to the profession for general use.

The work of our Denver staff accumulates in the form of specifications which are widely circulated to many contractors, with an invitation to bid competitively. The methods and procedures used in the solicitation of bids and the receipt and handling of them, as well as award of contracts, are prescribed by another Federal agency to assure fair and impartial treatment of the bidders and to maintain the integrity of the competitive bidding system (which is required by Federal Law). Direct negotiation with contractors is not permitted on government work, except in rare and unusual circumstances. Now, more than 98 percent of our work is performed under contracts.

At this point, our engineers, who are experienced in construction work move to the job site. At the

same time, a flow of information to Congress must be established to assure that funds are made available to keep the construction work on schedule.

As in private practice, it would be advantageous at this early stage for the Bureau to have sufficient money to cover the entire project financing. This would permit accumulation of all field data necessary for final design of all the structures and project works. Such is not the case. Therefore, concurrently with the commencement of construction, we must also continuously gather additional field design data for the design and subsequent construction of all related features. We are guided in this by a previously prepared master plan, which sets forth the general operational plans and the basis for the final design of structures required for the accomplishment of the objectives. However, as the construction progresses, and as more accurate design data become available, we are frequently required to make modifications to accommodate unusual subsurface conditions or to incorporate advances in techniques of construction.

As is true of engineers in private practice, we have our share of claims by the contractors. Many claims are verbal and represent dissatisfaction of the contractor with orders from the contracting officer. These slight differences of opinion are settled on site. Some differences of opinion, however, assume the proportions of a dispute. Under Federal contracting requirements, the contractor has the right to exhaust all administrative remedies. This may involve a finding-of-fact by the contracting officer or a decision by the Board of Contract Appeals at the departmental level; a suit in the Court of Claims; or, finally, a request to the contractor's Senator or Congressman to intercede in his behalf and obtain relief through legislation.

One case, for which the Bureau of Reclamation is best remembered, is the Wunderlich case which arose as a result of the construction of Vallecito Dam, in 1936. The administrative problems raised by this contractor's claim required administrative and legal work, by our staff and by special advisers, which lasted for over 20 years. This is an extreme example.

Continuity in Work

Progressively, as portions of the project are completed, they are turned over to our operation and maintenance experts. These men are versed in the operation of structures and equipment consistent with our design criteria. Included in this group are agriculturists who know the soil and water conditions suitable for irrigation purposes. During the operation period, these experts also direct the maintenance, repairs, additions, and improvements that may be necessary. This continuity provides economic and efficient service. Should an emergency occur, our operating engineers must have the technical know-how and the administrative ability to get a contractor quickly.

It is apparent that there is a continuity to the Bureau's engineering work which extends from conception of a reclamation project to the operation and maintenance of the completed works. The matter of coordinating the activities and findings of our engineers with work of other specialists and scientists is ever present. The value received from their work, as determined by observing the operating results, lies in the fact that we use the experience derived from our past achievements and progressively improve our techniques in the planning and construction of future work. Just as any project unit must be considered in terms of its effect on river basin development, so must the work of any design unit be considered in its relationship to the over-all job. Design cannot be self-contained or separated from project investigation, research, construction, or operations.

Historically, the Bureau has performed almost all of its engineering design and construction with government employees. It also has been a long standing policy to hire private consultants to advise and assist on unusual problems or to do work of a specialized nature for which the Bureau is not staffed.

The continuity of experience of our staff has made available to each succeeding project significant economies and improvement in design and performance. For obvious reasons, no one private firm could expect to make available on a continuing basis such depth and variety of talent and experience as we are called upon to provide. We believe much of our professional competence comes from this continuity and accumulation of experience, both from the construction itself and from observing the operation after completion.

As an example of the Bureau's program, observe that the development of the great Columbia basin project in the State of Washington has been under way for about 30 years. This project could have been completed much sooner had it been practical to develop the million acres of land and the power potentialities all at one time. Wars and depressions intervened, and there were administrative problems settling new farmers in sparsely populated areas. But the outstanding achievements on this project are the results of coordinating a variety of skills within the Bureau. This outstanding accomplishment changes the whole economic outlook of the great State of Washington.

Through our efforts in research, both upon the physical properties of material and upon new techniques in construction, we also contribute to the advancement of the art. Engineers in private practice profit from the experience of engineers in government. Just recently, the Bureau made its know-how available to the public in the form of a book called *Design of Small Dams*. While this is engineering information on small scale public works, we also have published many technical papers and monographs which are in the public domain and are available through technical libraries.

A major current research activity of the Bureau is investigating means of reducing evaporation in order to save water. We hope that our efforts will be successful, since preliminary research indicates that a method of covering reservoirs with monolayers could reduce evaporation by as much as 50 percent. When it is considered that as much as 7 feet per year of reservoir depth may be lost through evaporation from reservoir surfaces, reduction of this loss will be recognized as vital in the conservation of water.

Further Research

Our research also has produced a new and different method for the selection of sound aggregates. This method, of course, is not patented and is available to other members of the profession. In research, we believe that engineers in government make contributions which are not otherwise possible.

I must also mention that our engineering organization is called upon to perform certain extraneous tasks. These tasks increase our engineering costs, but they are also an important public service. As an example, the Bureau of Reclamation was called upon by the Senate Select Committee on Natural Water Resources. No other organization of the government was in a position to furnish such comprehensive information on water resources development and potentials in the Western states. Engineers in private practice should benefit greatly from this comprehensive and excellent study by the Select Committee, since it outlines the areas in which a considerable amount of private work should be undertaken from year to year. Included are conservation and storage facilities to provide water for pollution abatement, municipal water, recreational facilities, sewage plants, power systems, and brackish water conversion plants. Some of the outlined work, because of its magnitude, could only be undertaken by the Federal government, but it must be remembered that every Federal construction job provides employment of professional engineers both outside and inside the government.

As a public administrator, I am accountable to the Congress to carry out both the duties placed with the Bureau by law and the desires of various Congressional committees, as expressed in their reports and findings. We operate literally in a fish bowl, under close scrutiny by the Congress. Therefore, the size of the organization and the number of personnel in various fields of activities, as well as our engineering costs, are constantly under scrutiny. It is well that all of our activities come under this constant observation, for it provides assurance to the public that we are not "empire building." It also serves as an incentive for us to work efficiently and competently.

Many of our top administrators are engineers by profession, licensed to practice. Because of their desire to perform the greatest good for the greatest number at the least cost, they also desire to hold engineering design and construction costs to a minimum. This also is true of our engineers who are directly engaged in the details of design and construction, the majority of whom are registered professionals.

Personally, I am always looking for better, more efficient and expeditious ways to handle the Bureau's work. Secretary of the Interior Udall, and the Congress, expect me to use good administrative judgment in carrying out the affairs of the Bureau of Reclamation. The problems associated with meeting these objectives are many. They include the performance of design and construction work by the Bureau, but at this time I see no benefit to be gained from any radical change in the present method of performing the Bureau's engineering work. Depending upon the supply of new talent, we may have to place more emphasis on broader training and required experience, with fewer true specialists and more engineers with wider capabilities, in order to increase the quantity of work per employee. We will, however, continue to utilize private engineering talent when necessary and when good administrative judgment requires it. A recent example is a contract with a firm to survey and locate towers for 300 miles of high voltage transmission lines.

Look Ahead

Within the Bureau, we are looking forward to a more vigorous program of research to better utilize our material resources and to further the water conservation effort. Included in this will be an effort to retrieve, exploit, and take full advantage of appropriate and worthwhile foreign and U.S. research.

The Bureau has been very conservative in engineering its structures and in its methods of construction. I have encouraged and will support an invigorated and daring engineering approach to our objectives.

Bureau engineers have been, in large part, products of Western schools and colleges, where the educational programs provided for studies in irrigation and hydro power developments. Water resource development, however, is a nationwide problem. In order to maintain a flow of replacement talent to Reclamation and a supply of engineers for this country's requirements, who have an interest in and an educational background for such work, I believe the Bureau should take more active interest in the educational programs in schools and universities.

Particularly, I would like to obtain a greater realization among engineers of the need for visionary concepts of resources conservation and better understanding of the social factors that establish the design parameters for a successful engineering system. The development of know-how and "craftsmanship" is not enough. Our engineers must understand what can and should be done, which calls for value judgments and social decisions.

Government in Engineering

The Attitude of the

Rex M. Whitton received a degree in civil engineering from the University of Missouri in 1920, and went to work immediately with the Missouri State Highway Department. Starting as a member of a survey party, Whitton worked his way up through party chief, resident engineer, district engineer, finally to chief engineer of the State Highway Department. In 1961, President Kennedy appointed him Federal Highway Administrator. Whitton is a member of the Missouri Society of Professional Engineers and ASCE.

TWO MIDWESTERNERS recently sat down to discuss the role of the consulting engineer in the Interstate Highway Program. One was Rex M. Whitton, former chief engineer of the Missouri Highway Department and now Federal Highway Administrator, responsible for planning, disbursing funds, and supervising construction of the 41,000-mile Interstate system. The other was L. M. Van Doren, former chairman of the National Society of Professional Engineers functional section for engineers in private practice and chairman of the committee which produced "The Role of the Consulting Engineer in Federal Public Works Projects." Here is what they had to say:

Van Doren — Mr. Whitton, consulting engineers throughout the nation are wondering just what the role of the private consultant will be in the Interstate program under your direction.

Whitton — Since I became Administrator, this has not been discussed, principally because of the pressure of other work.

However, the amount of design work handled by consulting engineers will vary with the individual states. It is the duty of each state to get the planning done as quickly and efficiently as possible, and we in the Bureau merely approve or disapprove the programs submitted by the states. Therefore, the consultants' work will depend entirely on the capability of the states to handle the work themselves.

I spent 40 years and 10 months with the Missouri State Highway Department. So, naturally, my opinions are based on my experience in Missouri. And in my opinion, state highway departments should be organized so as to be able to handle normal work loads. This was my policy in Missouri. Of course, we used consulting engineers for peak loads and for extraordinary type design work, such as major bridges or intricate urban design.

Van Doren — Then, in most instances, you would consider it advantageous to use public employees to do the work? And consultants should be used only when the work cannot be handled by the state employees?

Whitton — My answer to that is that you cannot make a general statement of what is best. Each state has

its own problems with personnel. Its job is to get the work done as quickly as money is available, and only the people in each state know how this can best be done in their area.

In Missouri, we had adequate personnel to carry on the highway program until 1956, but with the increased planning load starting that year, we were unable to produce as fast as we thought we should. We retained consulting engineers to do a great part of our immediate Interstate work. But as the consultants were doing this, we were building up our organization to where it could again handle the increased normal work loads. Under the conditions we had in Missouri, I think this was the most economical way to handle the situation.

Van Doren – We consultants often hear claims that state highway departments can do design more economically than can consulting engineers. Do you have any idea of the comparative costs in Missouri?

Whitton – I have not seen an actual cost comparison, although I know Missouri was keeping such cost records.

Van Doren – I am sure that you understand that consulting engineers would like to be considered for performance of services in connection with much of the "usual" work load in highway design, as well as for unusual, peak load, and emergency work. We believe that individual consulting firms must prove their ability and competence, and that their use should be based upon the best interest of the public. We feel that the same philosophy should apply to the use of private enterprise in engineering as applies to the use of private enterprise in construction and manufacturing, particularly where large productive capability is required. We understand that some state highway men assume that it is cheaper to have state employees do design work, even though this assumed economy has not been proven. Could it not be said, by this same type of logic, that it would also be less expensive to have state employees do the construction work on state projects?"

Whitton – I see no particular comparison between the two, nor do I foresee that there is any possibility that the states will attempt to organize construction departments. I believe that, until 1956, most states had their own employees handle the engineering. Then, with the advent of the big program, they asked consultants to absorb some of the work load in order to get the program moving.

In Missouri, I worked with some top consulting firms. They understood our policy, and I found no particular disagreement with our philosophy.

Van Doren – Mr. Whitton, what do you think of the Blatnik investigations?

Whitton – As I have said publicly many times, I would like to see all highway departments free of any mismanagement or dishonesty. I think the investigations have, to an extent, been helpful. They have called the public's attention to any existing misdeeds. Of course, I would not want to see the entire program damaged by too much publicity resulting from a minute percentage of wrongdoing. But if anything is being done wrong, the Bureau, Congressman Blatnik's Committee, and everyone else should do all in their power to correct it as soon as possible.

Van Doren – Mr. Whitton, during the coming years of the administration, I am sure all organizations of consulting engineers will be anxious to work with you in any way possible to uphold the highest possible standards of design on the Interstate program. If you ever have any problems along this line, we hope you will let us know about them.

In this connection we feel that the professional engineers in state highway departments who are most familiar with individual consulting firms' work should have prime responsibility for selection of consulting firms where used, so that any firms who have not performed satisfactorily will not have opportunity to further embarrass the other consulting engineers or the highway departments.

Whitton – I appreciate your offer. I had a pleasant relationship with consulting engineers in Missouri as a whole, and I gather the department still does.

We all share a common interest. We want to get the program going and keep it moving. And I hope we can all work together toward this goal.

Government in Engineering

The Department of Health, Education and Welfare

Gordon E. McCallum is Chief of the Division of Water Supply and Pollution Control of the Public Health Service, U. S. Department of Health, Education and Welfare. A native of Hastings, Michigan, he has been a career sanitary engineering officer of the Public Health Service for the past 25 years. Before his present job, McCallum served as Special Assistant to the U. S. Surgeon General.

ON JULY 20 OF THIS YEAR, President Kennedy signed into law P. L. 87-88, strengthening and expanding the Federal Water Pollution Control Act of 1956. It is considered by many as the most important resource conservation measure enacted by the 87th Congress.

The new legislation will reduce pollution, not only by increasing grants for building sewage treatment plants, but also by providing more (and badly needed) research, stouter enforcement of antipollution laws, and increased financial aid to state and interstate water pollution control programs.

Half a decade has made a difference in the nation's needs and assessments in the vital issue of polluted waters. The administration of the Water Pollution Control Act has brought sharply into focus those points at which greater effort and expenditure must be made. Remedial measures on rivers like the Yadkin, the White, and the Missouri must not stop short of their total clean-up goals. Countless other streams need similar attention. Achievements under Public Law 660 have been good, but not good enough.

In the five years ending June 30, 1961, Federal grants totaling $232.5 million were allocated for the construction of more than 2600 municipal sewage treatment projects. Of these, 1400 now are complete, 700 are under construction, and 500 are approved for early starts. Their total cost: $1.3 billion. When all are finished, these plants, serving 43 million people, will improve 31,000 miles of streams. Each of the 50 states, the District of Columbia, and Puerto Rico have participated. All but six states have used their full allotment of the grant funds.

Still, at fiscal year's end, there existed a backlog of 1420 applications from communities seeking $124

million in Federal aid, for sewage treatment facilities to cost $750 million. Grant requests exceeded available funds by $114 million.

Nationwide, there is a need for some 5100 projects, including new plants where none exist, or enlargements and improvements where facilities are wearing out or are no longer adequate.

The Existing Problem

In terms of polluted waters, raw or inadequately treated municipal wastes of 42 million persons and an unknown number of industries are being discharged to the nation's waterways. It will cost $2 billion to eliminate the backlog of municipal waste treatment needs. No matter how you view it – whether in terms of population, treatment plant numbers, or cost of construction – this is a formidable backlog.

To wipe it out by 1970 and keep abreast of construction needs that come as populations grow and plants become obsolete will mean a 40 percent increase over present construction levels. Amendments voted by Congress this year to increase Federal aid to municipal sewage treatment works will go far toward getting the job done in this decade.

The new legislation increased the annual authorization for Federal grants from $50 million to $80 million for the 1962 fiscal year, $90 million for 1963, and $100 million for each of the four succeeding years.

Whereas under the old law the Federal share of a single project could not exceed $250,000, the new law allows up to $600,000. Also, communities now may pool their projects and receive up to $2.4 million for a joint sewage treatment facility. Funds unused by a state now may be reallocated to states where grant requests exceed original allocations. Many states may find a need to revise their existing laws, or write new ones, to take advantage of the joint community contract feature of the new Federal grants plan.

Investments in municipal waste treatment facilities have reached an all time high under the Federal grants program. Since its origin in 1956, construction activities have maintained a uniform 62 percent increase over the preprogram level. Costs other than those bid in actual contract awards have averaged 20 percent of total. This 20 percent includes such items as engineering, fiscal and legal services, and interest on bonds.

Even before the new legislation was passed and increased appropriations appeared certain, sewage treatment plant construction this year set new records. In the first four months of 1961, contract awards ran 24 percent higher than for the same period last year. Interestingly, in the same period, total public works and state and municipal construction rose only 10 percent over 1960. Usually other segments in these construction categories fare much better than do sewage treatment plants.

Construction grants for sewage treatment works have stimulated a great deal of local spending with a comparatively small outlay of Federal funds. In this program to abate water pollution, each Federal dollar has been met with nearly $5 of local funds. Of the total costs associated with all municipal waste treatment works construction – with and without Federal aid – the Federal grants constitute only 8½ percent.

Significantly, every authorization in the Federal Water Pollution Control Act, beginning with the Congressional declaration of policy, is designed "to recognize the primary responsibilities and rights of the states in preventing and controlling water pollution." Herein lies the success of the construction program.

Once a grant offer is made, the regional Public Health Service Office is in direct touch with the individual community. This relationship facilitates prompt decisions and administrative action. Our field people become acquainted with the local officials and when problems arise, it is an easy matter to pick up the telephone and settle the matter then and there.

This is not a Federal construction program. The administrative procedures are designed to secure a maximum of construction with a minimum of regulatory requirements and without Federal interference in the normal relationships among the municipality, its engineer, and its contractors. We think we have been successful in this endeavor.

The Role of the Health Service

The Public Health Service does not become associated with a project until the community has applied for its grant and received approval and priority certification from the state water pollution control agency. Our eight regional offices have authority to review the applications when received from the states and to make the grant offers direct to communities. Washington gets into the act only when unusual problems arise that the field offices cannot handle alone.

Our field offices, working with the states, review the engineering plans and specifications before authorizing the city to advertise for bids. This has proved a protection for the reliable and well established engineering firms. Costly delays in construction have been avoided.

The Federal government is not a party to the sewage treatment works construction contract, but rather an interested witness. The city itself seeks competitive bidding and selects the successful bidder. Federal standards and procedures for bidding are not involved. It is, however, the function of the Public Health Service to determine whether the municipality has complied reasonably with regulations and has not acted arbitrarily or capriciously.

In short, the Public Health Service's participation can help both the engineer and the contractor. The few regulations we have are advantageous to good

engineering and to construction contract awards through competitive bidding. Unless there is evidence of fraud, local decisions are not questioned.

In general, our field engineers deal mainly with the municipality and its engineer in carrying out the responsibilities of the Public Health Service in sewage treatment plant construction. While the Public Health Service has minimal requirements pertaining to the contractor, he must comply with regulations of the Secretary of Labor relative to the Anti-Kickback Act and furnish performance and payment bonds not less than 50 percent of the contract price; in addition, he must maintain adequate fire, workmen's compensation, public liability, and property insurance.

This year's new legislation also specifies that the laborers and mechanics employed by contractors or subcontractors on sewage treatment grant projects shall be paid wages at rates not less than those prevailing for the same type of work on similar construction in the immediate locality, as determined by the Secretary of Labor, in accordance with the Davis-Bacon Act. Through the Public Health Service regional office, the community applying for a grant must request the Secretary of Labor to make the prevailing wage-scale determination. This then becomes a part of the bidding documents and of the contract. Sole responsibility for administering this new requirement will rest with the Public Health Service.

Qualifying for Federal Aid

Before a sewage treatment project receiving Federal aid is begun, the community must demonstrate (to the satisfaction of the Public Health Service) the ability to finance its share of the cost, and must hold title to the project site, including necessary right-of-way easements. These assurances have prevented many delays in payment to the contractor. Also, the construction contract must provide access to the work area for representatives of the Federal agency and the state while a project is under construction. This is necessary to determine when and if progress is sufficient to justify grant payment to the community.

Nearly all projects under the Federal construction grants program have been constructed by contract. This speeds up administrative time, since most of the basic issues already have been settled.

This year's amendments to the sewage treatment construction grants program seem certain to increase the future market for this type of public works.

In addition to Federal aid, six states — Maryland, Maine, New Hampshire, Vermont, Pennsylvania, and Georgia — provide incentive grants or other financial aid. As more states enact this type of legislation, construction will increase accordingly.

Even so, there will be a need for pressure from enforcement agencies in some areas to get the ball rolling. A Minnesota attorney, at the National Conference on Water Pollution last December, put it this way: "Most of the past progress in pollution control has followed the line of least resistance. It is good strategy to follow that line as far as possible and make the most of voluntary action. However, as experience has shown in many places, the program is now getting down to the tough nuts, some of which will have to be cracked by force. It is encouraging to note that the courts have usually sustained the pollution control laws and the acts of the state agencies thereunder. Yet it will undoubtedly be necessary to take further cases to court as resistance is met."

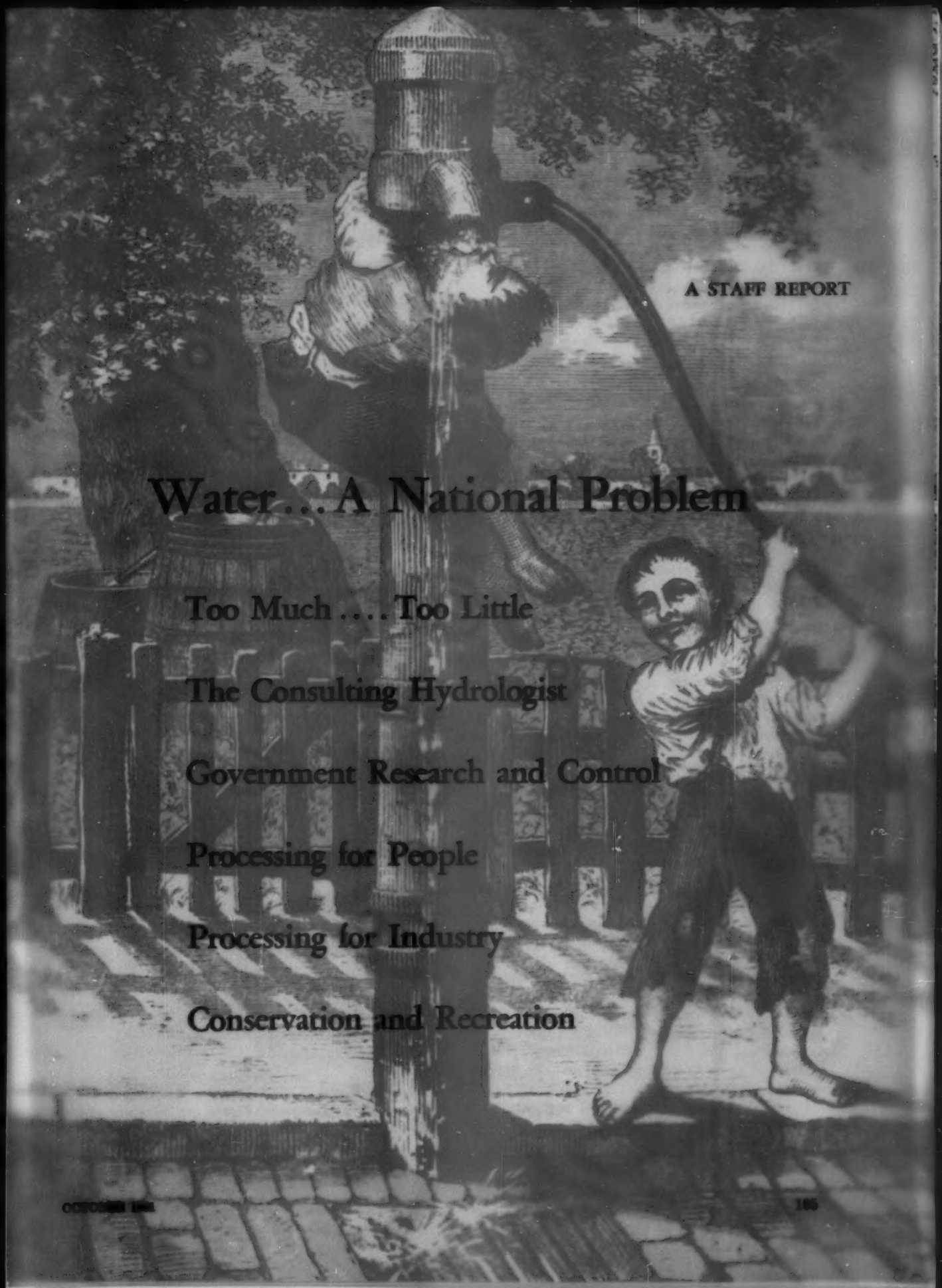
The 1961 amendments to the Water Pollution Control Act extend the Federal enforcement authority to all navigable waters, intrastate as well as interstate. However, in intrastate situations, the governor of a state must request the Secretary of Health, Education, and Welfare to enter. Also, if a conference and hearing procedure does not result in remedial action on interstate pollution, the Secretary of Health, Education, and Welfare is authorized to request the Attorney General to institute court action without the necessity of obtaining a state's written request or consent for such action.

The new law also increased the Federal program grants to state and interstate water pollution control agencies from $3 million to $5 million. This will strengthen activities of these agencies substantially, including the area of enforcement. Stepped up enforcement will inevitably have its impact on the construction of waste control facilities.

Under the 1961 amendments to the Federal Water Pollution Control Act, no changes in the construction grants administrative policies are contemplated. We believe the simple, uncomplicated operation of this Federal program has been its measure of success.

Weeks before final passage of the new legislation, the Public Health Service construction grants staff was preparing for its expanded responsibilities looming ahead. In line with the "states rights and responsibilities" policy, a half dozen state water pollution control administrators were invited to Washington for consultation. Key men from headquarters were also in the field conferring with regional offices and still other state administrators. This foresighted planning will bridge the transition from old to new regulations with a minimum of delay and with no interruption in sewage treatment plants now under construction or on the drawing boards.

For five years, Federal, state, and local governments have been working together at this job of water pollution control. In these five years, we have built $1.3 billion worth of sewage treatment plants, and have helped improve some 31,000 miles of streams. Now we have greater resources and a bigger job to do — a job which can be priced out at $600 million each year for 10 years to come. ▲▲



A STAFF REPORT

Water . . . A National Problem

Too Much . . . . Too Little

The Consulting Hydrologist

Government Research and Control

Processing for People

Processing for Industry

Conservation and Recreation

Water

Too Much . . .

"AND A RIVER went out of Eden to water the garden . . ." Genesis 2:10. Thus began the saga of civilization, for all the wonders of the Garden of Eden were dependent on the flow of this first recorded river. But even in Old Testament times there was a shortage of water, and the wells and rivers of those ancient days are the favorite settings for some of the best known Bible stories. By the time of the Romans, municipal water systems were magnificent feats of primitive engineering, for as Vitruvius said: ". . . of all things, not one seems to be so necessary for use as water . . . Hence great diligence and industry must be used in seeking and choosing springs to serve the health of man."

CE exclusive

In the United States, an adequate supply of pure water is taken for granted. But it has not always been so. New Yorkers already were suffering from pollution problems in the late 1700s, and it was not until the completion of the Croton Aqueduct, in the 1840s, that epidemic diseases gradually were brought under control.

Now the problem has risen again. This time, "the eagle has fouled her nest" on a scale that is truly magnificent. As President Kennedy puts it, "Pollution of our country's rivers and streams has — as a result of our rapid population and industrial growth and change — reached alarming proportions. To meet all needs — domestic, agricultural, industrial, recreational — we shall have to use and re-use the same water, maintaining quality as well as quantity. In many areas of the country we need new sources of supply — but in all areas we must protect the supplies we have."

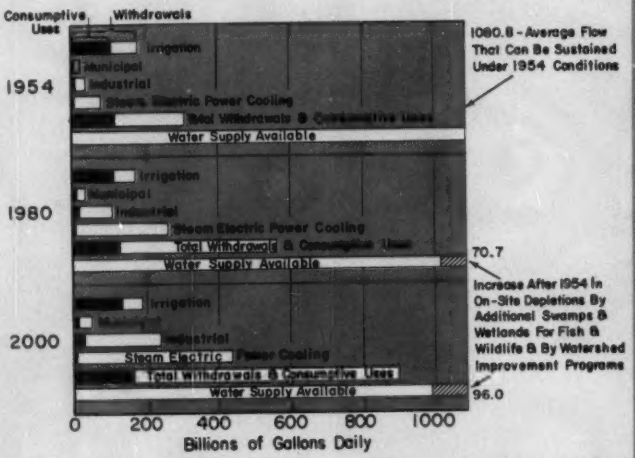
On a more encouraging note, C. F. Wertz, past president of the American Water Works Association, stated, "Although a thousand communities in the United States may have to restrict the use of water this summer (1961) — it will most often be caused by the lack of adequate piping and other distribution facilities . . ."

Wertz went on to point out that engineers know how to supply the public with safe, clear, and palatable water. They will welcome the day when the public comes to appreciate this fact and is willing to pay the price for quality water and service.

Most experts on water agree that the national shortage, viewed as a whole, is qualitative — not quantitative. However, more than a century of indiscriminate pollution of surface waters in the central and eastern states has sharply reduced the amount of water suitable for municipal use.

Distribution vs Need

In the 17 states of the West, a physical shortage of water exists, since only 25 percent of the national supply is distributed over these vast areas. This shortage is compounded by the fact that 80 percent of the national consumption, primarily for irrigation, occurs in the western states. The relatively water-rich central and eastern states consume only 20 percent of the national supply. Ironically, those states with adequate water supplies are able to withdraw and return to the source most of the water they use, while states in



Water use by categories. Figures for 1954 are actual totals. Figures presented for 1980 and 2000 are estimated.

. . . Too Little

critical need of water follow agricultural practices that prevent the re-use of most of their supply.

Water Use

Since 1900, the demand for water in the United States has increased sixfold, to a daily rate of 240-290 billion gallons. Population trends indicate that we will have 225 million people in 1980 — using water at double the present rate. By 2000, we will be using 900 billion gallons per day — 90 percent of the then available total national supply. Since 1955, total water use has increased 17 percent while per capita use increased only 7 percent and use of saline water, primarily for cooling purposes, doubled.

According to United States Geological Survey figures, our present total available water supply from all sources is about 1200 billion gpd. Of this, slightly less than 400 billion gallons can be termed dependable, although that figure can be increased by adding storage facilities, regenerating ground supplies, controlling evapo-transpiration and seepage from storage, reclaiming water from industrial and municipal wastes, and perfecting desalinization processes.

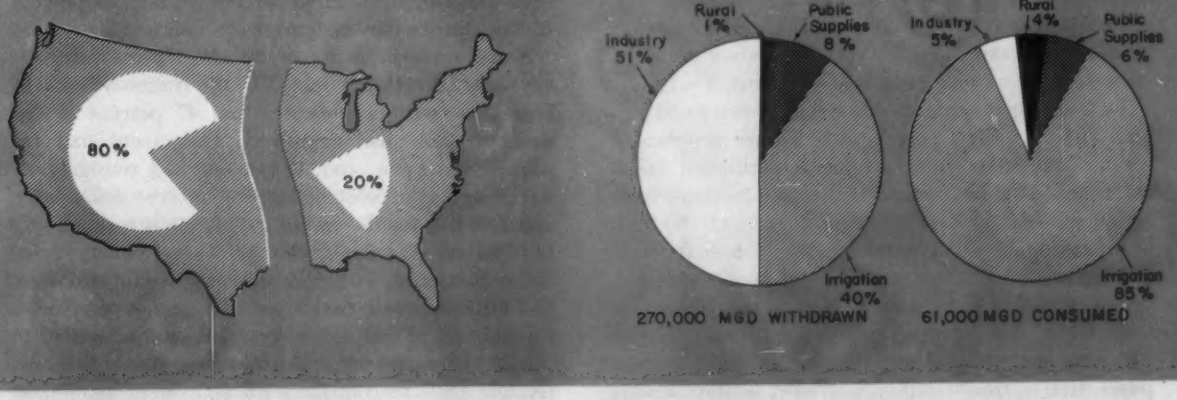
The Effect of Pollution

Though reasonably correct quantitatively, these figures do not reveal that about 45 percent of the present municipal water supply is inadequate, and that the line of demarcation between polluted and potable water is very thin. Widespread human or mechanical failures of municipal purification plants could result in epidemic disease or mass poisoning.

The plight of the state of Ohio illustrates this point. Over a century of wanton ground water pollution has converted Ohio's surface waters to little more than open sewers. The filthy Cuyahoga and other highly polluted streams empty their wastes into Southern Lake Erie, Cleveland's sewage dumping ground and water supply. Southern Ohio rivers, often deceptively clear, drain municipal and industrial wastes, silt, and acid mine wastes into the already polluted Ohio. To fight this menace, Ohio communities already are spending $47 million per year on water and sewage works, but they must spend a total of $500 million just to correct existing conditions.

The Public Attitude

Certainly the citizens of some 10,000 American cities and towns who experienced waterless days last summer, when ground supplies or reservoirs ran dry, are aware of our water problem. However, public action usually stems only from fear or outrage — and neither emotion seems to have been thoroughly aroused yet. To date, indifference and opposition have marked attempts to issue bonds for financing water purification and sewage treatment facilities. Municipal and industrial pollution continues as local, state, and



Although the eastern states withdraw more water than the western states, more is consumed in the West. What appears to be a disparity in the charts is explained by the difference between reuse and actual loss consumption.

Federal officials seek to arouse a lethargic populace, through public statements in the daily press and the long, slow process of the law.

Despite technical and financial problems in industrial waste clean-up, industry is proving more cooperative than state and local governments. Although industry is not eligible for direct Federal or state assistance, incentives in the form of rapid tax write-off of treatment facilities and tax credits based on the extent of improvements are proving effective.

Wisconsin's sulphite paper industry, once the arch-foe of antipollution legislation, leads the way in curbing pollution from sulphite liquor by seeking methods of extracting by-products from paper wastes. By combining treatment and reclamation processes, the steel industry has found new profits from the salvage of mill scale and the reclamation of pickling liquor. And the plating industry, notorious for pollution, has been able to save materials and reduce pollution through new processing procedures.

How the Problem Grew

In the "good old days," water either flowed past our homes or was nearby in the form of a spring or shallow well. Because of the relative purity of the natural water, treatment was unheard of.

But water is not particularly selective about the chemical friends that it makes. Thus, with population growth and consolidation caused by the industrial revolution, water quality began to change for the worse. Industries and clusters of communities appeared on river banks, each using and misusing the rivers that carried increasingly greater loads of waste as they progressed toward the oceans and lakes.

Epidemics of water-borne disease in the late 19th century and early 20th century forced municipal water treatment, although by 1850, most cities and towns had piped-in water supplies. In 1900, there was an urban population of 30 million, and the prevailing water treatment involved only settling and filtration. Some 2 million people used surface supplies. Sewers served 25 million, and though the sewage generally was untreated, its volume was not yet great enough to affect recreation and wild life.

By 1920 our urban population had grown to 54 million, and 20 million people used surface supplies of water. Increased pollution forced additional treatment, and coagulation and chlorination facilities were added to settling and filtration plants. Of 50 million people served by sewers, 10 million had crude sewage treatment — not enough to prevent visible evidence of pollution in suburban recreation areas.

Of the 80 million urban population in 1940, 20 million were using treated surface water for drinking purposes. Half of the 70 million who used sanitary sewers were served by sewage treatment plants, and chlorination of sewage effluent was practiced on a limited scale. Local pollution had increased, and public indignation was becoming quite vocal.

World War II halted construction of new water and sewage treatment plants, but, between 1940 and 1947, cities grew as they never had before. Urban sprawl, accelerated by wartime industrial development, merged the boundaries of urban areas, creating nearly continuous high population density areas along major waterways. As a consequence, the sewage outfalls and municipal water intakes of cities and towns came closer together. Although sewage was partly treated, river waters could not recuperate from pollution shock before they were needed for domestic use.

The debilitating effect of wartime municipal pollution paled before the water degradation caused by new industrial contaminants in the form of stable synthetic compounds and radioactive wastes. Production of new species of these materials has increased almost geometrically since 1940, and although levels of human tolerance are known for a handful of these chemicals, the long range physiological effects of most of the synthetic compounds, including syndets, insecticides and pesticides, are not known. Most of these compounds survive water and waste treatment.

The Present Situation

The 18,000 or more water treatment facilities serving some 125 million people in the United States are able to cope with most of the current contamination problems, even though many of the present plants are obsolete or have serious deficiencies. It is still possible to travel from coast to coast and safely consume water from municipal supplies.

However, a 1955 U. S. Public Health Service survey of communities having over 25,000 population revealed that 20 percent of the water services had insufficient capacity; 40 percent had transmission problems; 33 percent were deficient in pumping capacity; and 40 percent had impaired treatment capacity. Ground distribution storages showed deficiencies of 29 percent; elevated 43 percent. In fact, 57 percent of the distribution systems were deficient.

A more recent study of 89 cities previously surveyed by USPHS, conducted by the National Board of Fire Underwriters, indicates that 47 percent of the water systems had improved, 12 percent had remained the same, and 41 percent had retrogressed.

The aggregate cost of meeting present deficiencies and building for the future population is a staggering $1.1 billion a year, exclusive of "softening" treatment. Total cost, including softening would run some $1.7 billion per year for the next 20 years. A companion expenditure of $42 billion over 20 years is needed to provide adequate municipal sewage treatment. Industry will have to contribute an equivalent amount to remedy its pollution. Still another $12 billion is required to impound water for waste dilution.

The West's dependence on irrigation is graphically portrayed here. Without water, this area would be desert.

The Consulting Hydrologist

KENNETH R. WRIGHT, Consulting Engineer

THE LEARNED MEN of the universities say that "the science of hydrology encompasses the behavior of water as it occurs in the atmosphere, on the surface of the ground, and underground." The hydrologist, then, is a man who works in this field. But this simple definition is not enough – at least for the hydrologist in private practice. He must, of course, know about "the behavior of water" as determined by scientific research, but, primarily, his function is to adapt this knowledge to the solution of a specific client's specific problems. And there is nothing more specific than a city thirsting for water during a drought, or a torrent tearing away trees, bridges, and homes.

Who He Is

Today's consulting hydrologist may be a man who was graduated from a university during the depression years, and went to work for a government agency. Assigned at first to the routine of computing stream flows, he may have worked his way up through jobs

of increasingly greater authority — possibly to the planning of multi-purpose dams. In another instance, the consulting hydrologist may have been a bright student who could not be dissuaded from majoring in water resources — even by his structural professors. Perhaps he then took a post-graduate degree before entering into an apprenticeship with an older, established hydrologist. Or, he may have been a man who made the switch from structural or construction engineering simply because he liked the prospect of leaving behind the building codes, tables, and safety factors to enter a field where broad concepts, judgment, and insight are the main engineering tools. Though engineers come from different backgrounds and enter hydrology for different reasons, they have one common denominator. They are fascinated with their work, and intrigued by the order of nature.

What He Does

The work of the consulting hydrologist is almost as varied as his background. However, his efforts generally are concentrated in the following areas.

¶ Water resources — study of surface water available from streams, storage, and ground water supplies.

¶ Water supply — design of reservoirs, pipelines, pump stations, galleries and appurtenants works, as well as design of facilities and spacing of wells.

¶ Flood control and drainage — flood potential studies covering size, frequency, and effect of floods; dam, sewer, retention pond, channel, and diversion facility design for flood control; and study of ways to handle excess surface and ground water.

¶ Legal engineering — the study of water rights and the effect of proposed new uses and diversions on existing water rights; presentation of hydrological study results in court cases; and evaluation of water rights.

¶ Sedimentation — studies of silt-laden streams, reservoir silting, erosion, and channel design and correction.

¶ Construction supervision — contracts and specifications, letting contracts, resident engineering, and project inspection.

By way of example, the hydrologist has an important role in situations such as that faced by a western town that expects its population to double within 10 years because of industrial growth. Water supply is the key to the realization of this growth potential. The design of the pumping stations, pipelines, distribution system, and storage tanks can be handled with tried and proven techniques. But, given a certain population, just what will be the water requirements in 10 years? In 20 years? This depends on such factors as people's personal habits, irrigation demands for present and future parks and lawns, and the expected types of industry. These items must be evaluated accurately in order to arrive at future water requirements with any degree of confidence. An erroneous estimate may have far reaching consequences for the community — both in physical availability of water and in invested capital.

Where He Works

In many areas of the west, there are limited supplies of water. To provide a firm water supply legally, a municipality must purchase existing water rights — often formerly used for irrigation purposes. Choosing the most efficient diversion point from a stream as well as the strategic placement of the sewage plant outfall might reduce the water right requirement by 50 percent. In view of the fact that it may cost $100,000 for the right to divert one cubic foot per second from a stream for five months of the year, a comprehensive investigation is of utmost importance. It must include a definition of historic use of the water right based on studies of past diversion, type of crops grown, consumptive use of water, and historic return-flow patterns, Finally, the municipality will have to go to court on a "change-of-point-of-diversion" suit, since it will be diverting water from the stream at a different point than formerly. In water-critical areas, these suits are hotly contested, and sometimes are appealed to the Supreme Court. As an expert witness, the hydrologist must be able to show the court what amounts of water can be diverted at the new location without adversely effecting junior water rights, and his findings must weather critical cross-examination.

Another example of the hydrologist's area of practice is the injection of water into oil-bearing strata for secondary recovery of oil. Though generally thought of as a problem for the petroleum engineer, the hydrologist is involved — particularly when the water originates from a limited ground-water aquifer also used by irrigation farmers. Where to place the wells, how much to pump from each well, how much interference to expect, and how much water can be used before farmers try to limit the program by legal methods — all are hydrological questions.

Often, the hydrologist's problems are out of the ordinary. A community located high in the Rocky Mountains was forced to steam-heat its water mains because of a 10-ft frost line. A consulting hydrologist was called in to find a more economical solution. After tramping around the countryside and talking with the local people, he discovered a long abandoned mine tunnel from which warm water flowed at a year round temperature of 50 F. Tests showed the water to be soft and pure. After choosing appropriate water rights and obtaining a decree for a change in point of diversion, the tunnel was ready for development as a new water supply source which provided its own heat to fight the frost problems.

The work of the hydrologist has infinite variations on the general theme of water. Like fingerprints, no two assignments are ever alike, because no two clients, streams, or aquifers are the same.

Water Government Research And Control

DEWITT CLINTON, the father of American hydrology, ran extensive studies of upper New York lakes and streams in the early 1800s, to determine the feasibility of his navigation canal project. About the same time, the U. S. Army Corps of Engineers began their classic hydraulic studies of the Ohio River and Mississippi River drainage basins.

Stream gauging, as such, did not begin until the middle 1860s, although stream evaluation was needed urgently planning new water supplies for New York City and Boston. Early gauging began in areas such as industrial New England, the Eastern Seaboard, and California's central valleys, where water was plentiful and close to points of use.

John Wesley Powell, first director of the United States Geological Survey, pioneered the marshaling of water, land, and climate facts that permitted the economical development of the western great plains and the far West. In 1888, Congress approved the first appropriation for an irrigation survey of the arid western lands and, in 1894, USGS pried the first stream gauging appropriation from Congress. Despite frugal Federal appropriations and catch-as-catch-can state aid, stream gauging networks broadened, until most of the stream gauging was Federalized under USGS during the 1930s.

Today, there are some 7000 gauging stations in operation, 75 percent of which are on streams draining more than 100 square miles. Although the current programs in the water field have been designed with the basic data procured from these stations, authorities feel that a minimum of 3000 additional stations is required, in addition to those maintained by the Corps of Engineers and the United States Weather Bureau. Many of these would be mobile.

Refractory seismograph used in a water resource survey project by Lockwood, Kessler & Bartlett in Syosset, N. Y.

Mapping

Information contained on topographic maps is essential in planning and designing water projects. Some $80 million a year is spent on mapping by the Federal government, but at present only 40 percent of the continental United States and its coastal areas have been adequately base-mapped. Most of the mapping is directed toward specific military and other high priority goals, and only $5 to $6 million is spent on general purpose topographical and geological work.

Some 85 percent of the United States is not on large scale geologic maps, and over 100 million acres of Federal forest land and a half billion acres of farm land have yet to be surveyed for resource evaluation and soil conservation purposes.

The slow progress of complete mapping is due partly to the obsolescence of mapping scales, and priorities given to remapping the rapid changes in key areas. This practice has drawn strong criticism from engineers who have had occasion to work in scantily mapped or totally unmapped areas. After all, an old map is better than no map at all.

Meteorology and Hydroclimatology

Since the atmosphere is an integral part of the hydrological cycle, meteorological and hydroclimatological studies provide important data for water engineering projects. All our water is supplied by rain or snow,

and, in the United States, the atmosphere reclaims 75 percent of the precipitation — leaving some 1200 billion gpd to runoff.

Within the continental United States, the U. S. Weather Bureau maintains some 12,000 standard rain gauges and numerous stream gauges. The Bureau also maintains technically staffed weather recording stations, chiefly in metropolitan areas. But it relies heavily on the reports of some 9000 citizen-operated standard rain gauge stations in rural areas, and on other agencies' automatic recording stations in remote areas of the country. The latter record precipitation and stream flow affecting over-all river water levels. Radar, developed during World War II, is aiding weather forecasting, and there are indications that long range weather investigation will be aided by upper atmosphere and space probes.

Modern hydrology, developed from meteorology, still relies heavily on meteorological data. Several of the joint hydrological projects of the Bureau of Reclamation, USBS, and the Weather Bureau involve control of evaporation from water storage reservoirs and development of methods of determining the extent and control of evapotranspiration from vegetation and land areas.

The need for specific mapping and meteorological, climatological, and hydrological studies applied to the design of specific projects has caused a number of engineers to enter private practice in this field.

Reclamation

The Bureau of Reclamation program covers 75 percent of the Federal irrigation projects and 90 percent of the known potential non-Federal irrigation works. Current composite Federal-state projects include: reclamation of 9.5 million acres at a cost of $12 billion; the California Water Plan, affecting 4.8 million acres at a cost of $8.6 billion; and other non-Federal irrigation projects involving improvement of 2.7 million acres at a cost of $1.4 billion.

The Department of Agriculture watershed improvement programs involve a $4.5 billion, 20-year nationwide improvement of 233 million acres. Stock ponds, small reservoirs, and watershed structures are to be constructed, many of them in the East.

Flood Control

Out of $9 billion that has been authorized for flood control works, the Corps of Engineers has spent nearly $4 billion on the construction of 220 reservoirs, 9000 miles of levees and flood walls, and over 7000 miles of channel improvements. The authorized program will, when completed, provide 125 million acre-feet stored in 330 reservoirs, 12,000 miles of levees and flood walls, and 10,700 miles of channel improvements.

An additional $500 million is required to develop flood control works for eastern and Gulf Coast areas exposed to hurricane-caused flood damages. To offset the tendency toward industrial encroachment on flood plains and consequent exposure of industrial properties to flood damage, an estimated $6 billion will be required for projects through 1980.

The Corps of Engineers spends $300 million on flood control annually, providing $500 million in flood damage protection. Projecting flood control construction to 1980, the current $300 million annual rate of spending will reduce flood loss potential from $960 million to $660 million.

Navigation

The Corps of Engineers expects water freight traffic to double by 1980 and quadruple by 2000, requiring substantial improvements to our inland waterway system. Authorized improvements and extensions of waterways will cost $2.5 billion of the current budget, and cost of development of potential new inland waterway projects is an estimated $5.4 billion. The latter amount has not been authorized, and, in fact, is under sharp attack by rail and highway carriers.

Federal vs Non-Federal Water Management

Water resource management in the United States just grew. The law is confusing, since Eastern and Western states recognize different water laws. Traditionally, local and state governments are responsible for their water resources, but a river basin rarely respects local and state boundaries. Ground water, likewise, does not conform to political boundaries, and disputes over surface and ground water rights have led to some interesting interstate litigation.

Since it was illogical for river basin planning to remain a function of individual states, the National Resources Planning Board was formed in the '30s. Although individual states had worked out effective reciprocal water agreements, this was the first formal step towards coordinated water resource planning on a national scale.

Greater demands for water due to increasing population, burgeoning industrial growth, and migration to cities intensified local and state problems. To resolve these interstate area water differences, multiple purpose planning organizations and commissions such as the Tennessee Valley Authority were formed. More recently, the U. S. Study Commission (1958) and the Select Committee on National Water Resources (1959) were established. The former concerned itself with multipurpose planning in Texas and the southeastern states, and the latter has conducted some 90 comprehensive national studies directed at total evaluation of water resources.

Federal vs State Control

Water shortages, particularly in the West, have led to conflicts in authority between state and Federal

governments. The Federal government, holding large areas of public land, has at times asserted absolute rights to unappropriated water resources in states containing these public lands. Federal power of regulation over waters within individual states leads to conflict of interest, and may act to impede a state's optimum development of water resources.

A modification to Public Law 660 extends Federal powers over all navigable streams – a power previously limited to international and interstate waters. This bill also increases Federal grants to states from $3 million to $5 million, to spark state participation in antipollution activity.

California recently ran afoul of Federal authority when the state authorized the $1.8 billion Feather River and Delta Diversion Projects, designed to bring waters from the Feather River in Northern California to the parched southern portion of the state.

In an action between the City of Fresno and State Water Rights Board (City of Fresno vs State Water Rights Board, California Superior Court, Fresno County, No. 105245), the Federal government intervened, and asserted "its ownership of all of the lands and all rights to use water within the area." The claim is based upon the 1848 Guadalupe Hidalgo peace treaty between United States and Mexico, which includes five other states besides California. Pending the decision of this case, water rights are confused in these six states and others within areas acquired by treaty.

Under Senate Resolution 48, the Select Committee on National Water Resources is directed to make exhaustive studies of how water resources activities in the United States are related to the national interest. Briefly, the major categories of corrective effort defined by the Select Committee are:

¶ Regulating stream flow through construction of surface reservoirs and watershed management

¶ Improving the quality of our streams through more adequate pollution abatement programs

¶ Making better use of underground storage

¶ Increasing the efficiency with which water is used, through elimination of wasteful practices, improved sewage treatment methods, recirculation, increased irrigation efficiency, and, where practicable, substitution of air for water cooling.

¶ Increasing the natural water yield by desalting, weather modification, and other artificial means

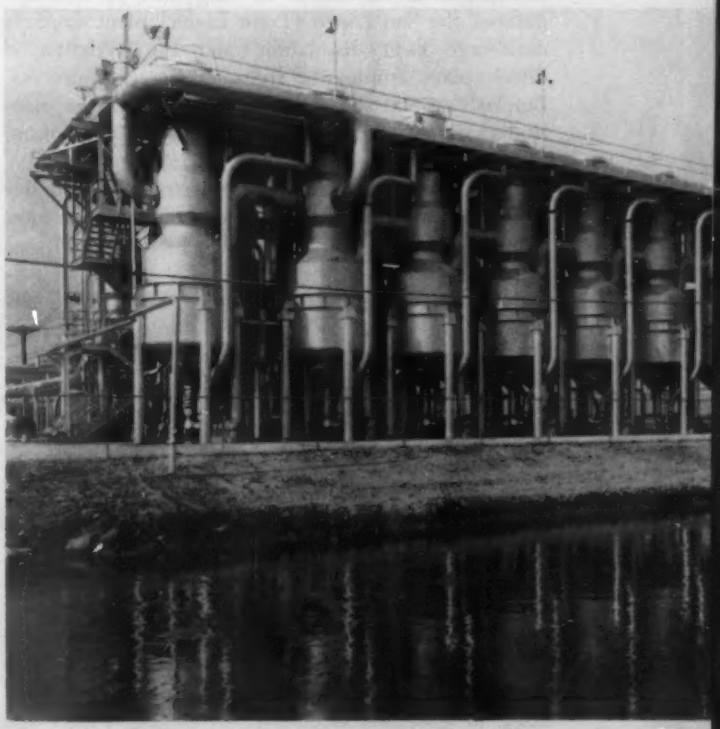
Desalting

Man has long dreamed of tapping the sea for his water requirements. Britain's Elizabeth I realized the importance of desalinization when, in 1567, she offered the equivalent of $20,000 for the invention of an efficient desalting process.

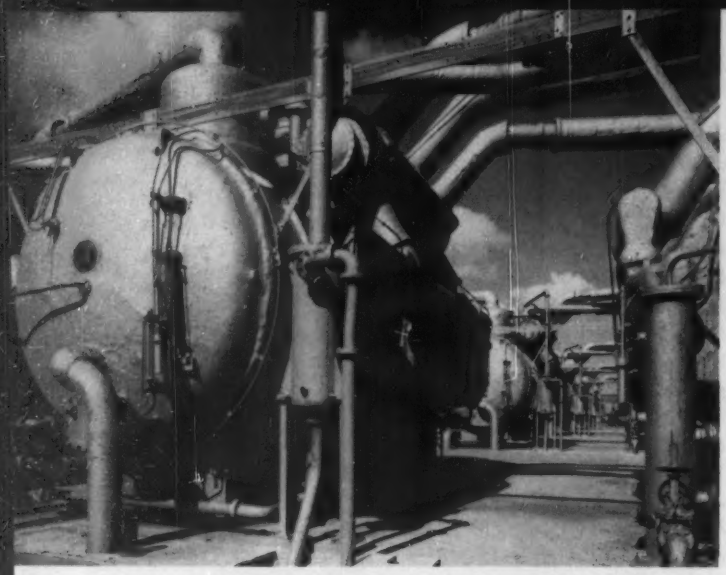
Real – and possibly imaginary – water shortage problems propelled the U. S. government into research and development of desalinization. With the signing of Public Law 448, in July 1952, the Secretary of the Interior was authorized to set up the Office of Saline Water (OSW). Subsequent studies by OSW revealed, among other things, that over half of the 50 states had ground supplies of brackish waters. Some 20,000 communities surveyed had highly mineralized supplies needing treatment. The bulk of these communities were in the north central and southwestern states.

Public Law 85-883, passed in 1958, authorized the construction of five desalting plants. Three were to be 1 million gpd units, one each on the Atlantic, Pacific, and Gulf Coasts. The other two were to be used for brackish water treatment in the southwest and north central areas. One of these was to have a 250,000 gpd capacity.

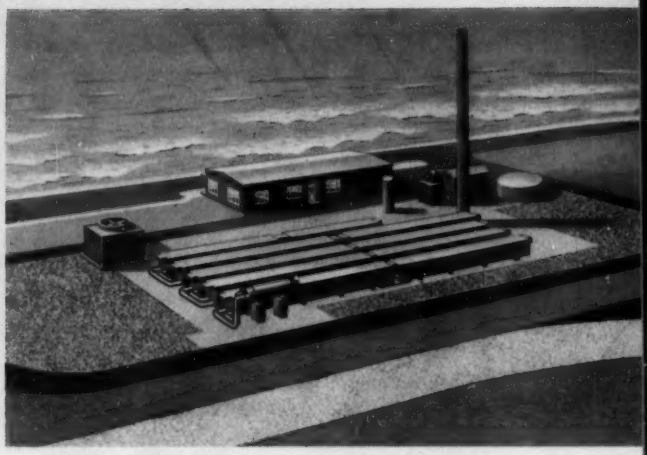
Over 200 cities immediately asked that they be considered for plant construction. Requests came from all the perimeter coastal states, 12 inland states, and Alaska and Hawaii. A three-man board, established to evaluate proposed sites, analyzed the requests, visited the sites, and submitted recommendations to the Secretary of the Interior. Sea water conversion plants were assigned to Freeport, Texas (now finished); San Diego, California; and Wrightsville Beach, North Carolina. Plants for treating brackish



The Freeport, Texas, plant of the OSW, first of 5 major pilot plants in operation, employs multiple effect distillation.



The 2.7 mgd Aruba plant designed by Singmaster and Breyer, New York, uses steam from oil-fueled boilers to produce fresh water and generate electrical power.



Located near San Diego, California, the Point Loma plant of the OSW program employs long tube, multiple effect apparatus (Westinghouse) for desalting sea water.

water supplies were assigned to Webster, South Dakota; and Roswell, New Mexico.

Admittedly experimental, these plants all use different processes for desalting, and comparative efficiency studies of the various processes will provide valuable data for evaluating future Federal and private desalting enterprises. The Freeport plant employs multiple-effect distillation in long tube vertical apparatus, the San Diego (Point Loma) plant employs multistage flash distillation, and the Wrightsville Beach plant employs a freeze-evaporation process. Brackish ground water is converted to fresh by electrodialysis at Webster, and by forced circulation, vapor compression at Roswell.

One of the first plants to operate on a productive basis was the 200,000 gpd vapor compression plant at Dhahran, Saudi, Arabia, which is processing softened well water with about 2700 ppm total dissolved solids. This diesel powered plant has a relatively high fuel economy, achieving up to 300 pounds of water per pound of fuel. The system employs pretreatment of feedwater to reduce scale, resulting in a conversion cost of between $1.50 and $2 per thousand gallons. Currently, this cost is about average for fresh water produced from sea water by distillation processes, although the goal of those working on desalting processes is to produce fresh water for $1.00 per thousand gallons.

The largest sea water distillation plant in operation today is the 2.7 mgd distillation plant on the Island of Aruba, Dutch West Indies. Designed by Singmaster & Breyer, New York consulting engineers, the plant uses waste heat from plant distillation processes to generate electricity, producing power for about three mills per kwh. Cost of water production, reduced by sale of electricity, makes water available to the consumer for about $1.25 per thousand gallons. Shipped-in distilled water formerly cost the Arubans $2 to $3 per 1000 gallons.

The plant incorporates five sets of six-effect evaporators, each with a capacity of 2000 metric tons (540,000 U. S. gallons) per day. Unusually high operating temperatures combined with the six-effect evaporation system produce five pounds of water per pound of steam used.

An experimental pilot plant at St. Petersburg, Florida, built for OSW, is producing water from the sea by the freezing process, using a refrigerant added to the feedwater and subsequently removed in a complicated wash cycle. Plant capacity is an estimated 35,000 gpd. The cost of producing large quantities of demineralized water by freezing methods is expected to be $0.50 to $1.00 per thousand gallons.

In Coalinga, California, an electrodialysis (membrane) process was put into operation several years ago to demineralize the town's brackish (approximately 2400 ppm) ground water supplies. Before this process was installed, the town was using shipped-in water which cost the consumer $10 per 1000 gallons, and required a dual water supply to homes. Eighty-three percent of the total dissolved solids (TDS) is removed, and delivered cost of the treated supply is about $1.43 per 1000 gallons. This cost is considerably higher than the $0.20 to $0.60 per thousand gallon cost attributed to large scale electrodialysis methods by government sources.

John R. Snell Engineers, Inc., Lansing, Michigan, has developed, on a laboratory scale, a device applying a vaporization principle to desalinization which operates efficiently at atmospheric pressure. The salt water is fed across the top of 10 stainless steel plates. As it passes down the face of the first plate,

A laboratory scale model of a ten-stage distillation apparatus developed by John R. Snell Engineers, Inc., Lansing, Michigan, promises future desalting economies.

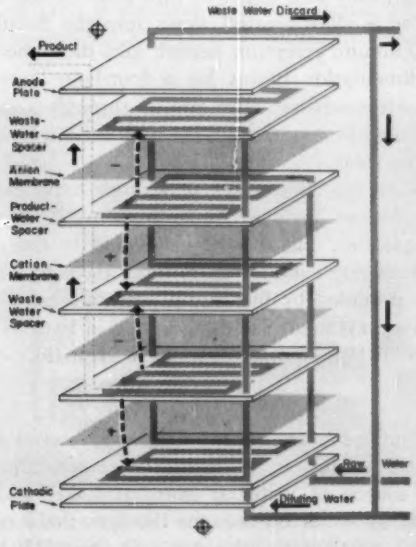
which is heated, it vaporizes. The vapor travels to the adjacent cooler plate, where it condenses, producing fresh water. Condensation of the water creates heat which passes through the second plate, and the process is repeated between the faces of the second and third, third and fourth, and so on to the tenth plate. This ten stage still is highly efficient and can be run by solar or waste heat. The projected cost of this operation, including equipment, is about $0.30 to $0.45 per thousand gallons.

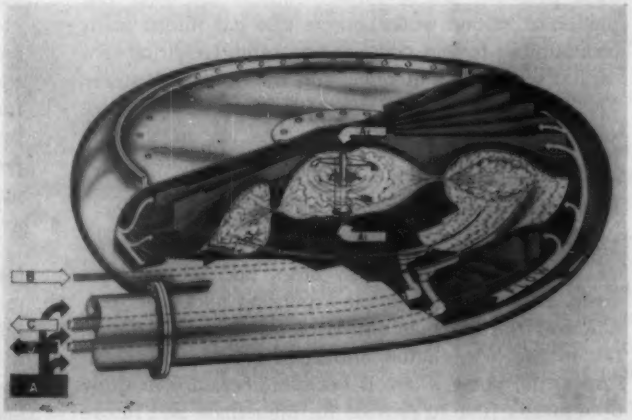
Solar stills have been used for many years. A classic example is the 50,000-sq ft solar still built in the 1870s for a Chilean mining camp water supply. Performance obviously varies directly with exposure to solar radiation, and the orientation and construction of the still is critical. However, there is application for these devices where fuel is scarce or nonexistent, or where limited amounts of water are required.

Converted saline water cannot possibly be considered a replacement for conventional surface water supplies, but where the cost of procurement and treatment of surface waters is high, the desalting process may be economically advantageous. For instance, the Metropolitan Water District of Southern California seriously considered desalinization for its subscribers. However, existing processes cost too much and capacities are too low. Fresh water still can be brought in from storage hundreds of miles away at costs of one-third to one-tenth that of the most efficient, currently operating, desalting process.

Trouble has already occurred in pilot plant operation. The million gpd Freeport, Texas, distillation plant, the first of the 5 major pilot plants to be placed in operation, has been shut down for repair. It seems that carbon steel plates in the heat exchanger apparatus have decomposed badly in the last five months.

The pilot plant program of OSW has been strongly criticized by various consulting engineers in the water field (CONSULTING ENGINEER, June 1961). The feeling is that OSW should have invested more time and money in research rather than in construction of pilot plants based on processes that seem to have definite economic limitations. However, these plants will provide valuable economic data and may even be the springboard for important technical advances.





The radial still, shown above, was developed by General Research and Development, a division of Buchart Engineering, consulting engineers, York, Pa. It differs from conventional distillation processes in that it uses a concentric configuration of elements. The salt water, plus heat, introduced at the center, vaporizes, and passes through a peripheral venturi into the outer chamber where fresh water is condensed. At the left is one version of the electrodialysis (membrane) system, similar to the one used at Coalinga, Cal.

Water

Processing For People

TODAY, it is a rare thing to find a raw water source needing little or no treatment. Pollution has forced increases in plant size and the use of complex treatment processes where surface sources are used. Depletion of ground water sources also has forced many communities to find new sources, often requiring new capital investment in plant and distribution systems. This is occurring in Ohio, Michigan, Pennsylvania, and other water-rich states as well as in the dry Western states.

District of Columbia

The problems of the District of Columbia are typical of those in many other cities and metropolitan areas. Phenomenal postwar expansion and gross pollution of the Potomac and tributaries strained facilities of the Washington Suburban Sanitary Commission to the point where it became necessary to draw up a master plan to provide for immediate and future expansion needs.

Part of the $12.2 million first phase of the $29 million Potomac River Project is the $5.5 million Watts Branch Filtration Plant, at Rockville, Maryland. Designed by Whitman, Requardt & Associates, a Baltimore consulting firm, the treatment facility is one of several now under way. The 30 mgd plant, designed to supply water to 360,000 Montgomery County residents, operates with automatic controls.

Centrifugal intake pumps of the Watts Branch plant draw water from the Potomic via 60-in. diameter concrete penstocks, lifting it to a large concrete receiving basin atop a nearby hill. Leaving the basin, the water is alum treated, flows into the floculators for a 30-minute retention period, and then goes into two sedimentation basins for a four-hour detention period. After settling, it is passed through a system of six, 5 mgd fast-sand filters on its way to a 6 million gallon reservoir.

From storage, the water undergoes hypochlorination to destroy residual bacteria, algae, and other microorganisms, and then is channeled to the pump house. Pumping capacity of 64 mgd, through a 48-in. main, is provided by five pumps with a total of 5800 hp. Provision is made for the addition of two, 34 mgd and two, 16 mgd pumps, and a 54-in. main.

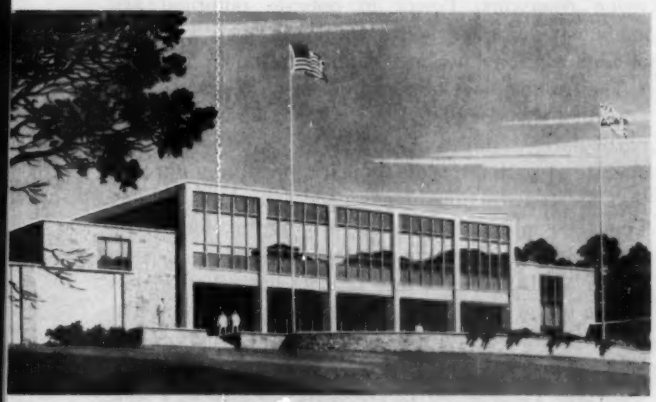
Denver

A different treatment situation is encountered when the water source is exceptionally clear. Denver's present source of water is Marston Lake, and the clarity of its water encourages the growth of microorganisms, particularly plankton and algae. This con-

An aerial view of the Chicago Central District Water Plant shows the immense size. Large gantry crane in background barely shows.

dition led Phillips-Carter-Osborn, Inc., Denver consulting engineers, to design a system using stainless steel microstrainers instead of slower sand fitters.

The new 60 mgd plant will employ 24, 10-ft diameter by 10-ft long microstrainer drums which will filter out 95 percent of the suspended solids. The straining medium is stainless steel wire fabric with 23 micron openings. Clogging is prevented by a water spray.



The Watts Branch Filtration Plant, Rockville, Maryland is typical of many plants which use river water.

In addition to Marston Lake water, the Denver plant will receive Blue River water through the 23-mile long Harold D. Roberts under-mountain tunnel, scheduled for completion in 1962. Designed by the firm of Tipton and Kalmbach, this project is one of the engineering wonders of the world. Work was begun in late 1956, after prolonged legal battles between the City of Denver, the Federal government, and private parties on the Colorado Western Slope. Putting the $50 million tunnel through 23 miles of mountain involved excavation through sections of fragmented rock under tremendous pressure. Costs ran to $400 per foot, requiring absolute accuracy in matching east and west tunnel shafts. The tunnel will be completed in early 1962.

Chicago

Water purification processes for large metropolitan areas and smaller towns vary only slightly. In essence, large systems simply involve doing successfully on a grand scale what ordinarily is done less majestically. The Chicago Central District filtration plant, now under construction, is a good example.

Billed as the world's largest filtration plant, the huge concrete peninsula jutting into Lake Michigan from Chicago's north shore will cost $104 million. The preliminary feasibility study and engineering design was done by the Chicago firms of Alvord, Burdick and Howson; and Greeley and Hanson. Plans and specifications on the head house and office were done by Naess and Murphy, Chicago engineers and architects. Rated at just under 1 billion gpd, with a peak capacity of 1.7 billion gpd, the system can be operated as a single unit or as separate plants.

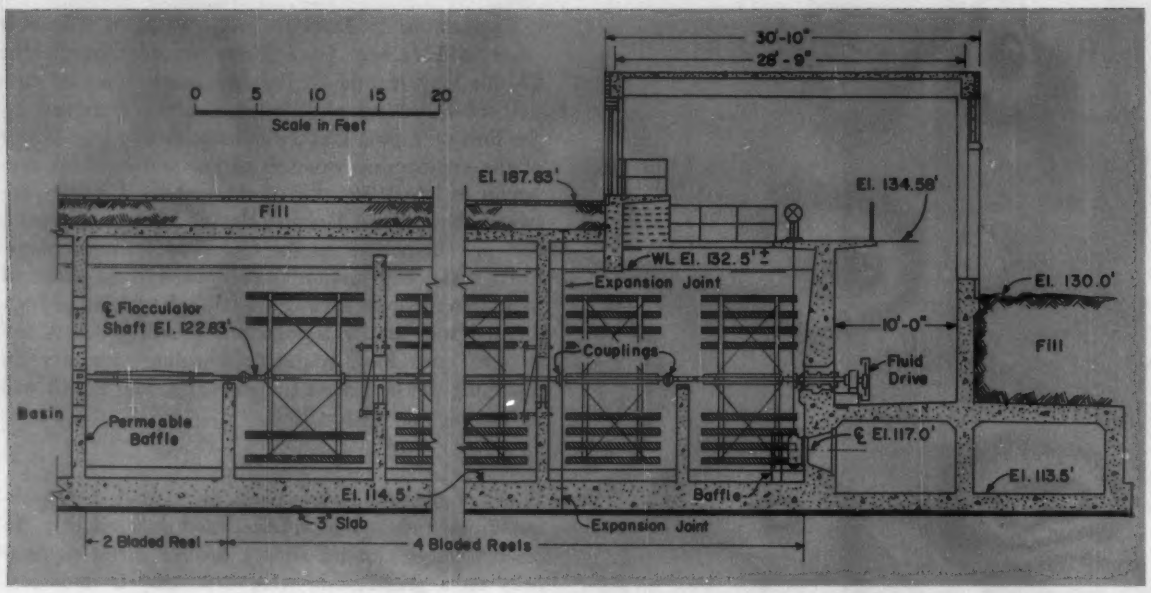
The water source is highly polluted Lake Michigan, with intake from the existing Dever and Carter Harrison water cribs 2½ miles from shore, or from 8-ft by 10-ft sluice gates leading directly to the pump intakes.

Construction of the plant substructure required a cofferdam 1100-ft wide and 2650-ft long for dewatering some 66 acres of lake bed. The first structure, a filtered water reservoir, is 480-ft wide by 964-ft long by 20-ft deep, with a capacity of 69 million gallons. When completed, the project will occupy 44 acres.

The present reservoir will be divided into two parts — one half to serve the North Water District; the other, the Central Water District. The mixing basins in each part are of the axial flow type, having four channels with slotted walls between the last channel and the upper level of the settling basin. Paddle-type floculators are employed.

Detroit

Among other metropolitan areas planning or constructing substantial additions to their present water systems is Detroit. Recently completed was a water works program that began in 1924. Dust had not set-



The Springwells Filter Plant, Detroit, Michigan, employs coupled paddle-type flocculators in 95-ft long concrete basin.

tled on the original plans when new planning was begun for a 20-year expansion program to serve a 5 million population in a six-county area.

The city currently operates three large filtration plants and pumping stations, supplying 50 suburban towns as well as Detroit proper. A fourth filtration plant and pumping station, designed by Parsons, Brinckerhoff, Quade & Douglas, New York consulting engineers, is currently under construction on the Detroit River south of the city. When completed, the plant will increase the system's rated output of just under 1 billion gpd to 1.3 billion gpd.

Industrial pollution of the Detroit River, mainly from metal working and petroleum wastes, has forced the use of rigid laboratory controls in the filtration operation. Automatic pollution monitoring is maintained to detect "slugs" of industrial waste before they reach water intakes.

Southern California

Chicago and Detroit are fortunate, since adequate water supplies, however polluted, are within easy access. Not so fortunate are the water-poor Western cities, such as those served by the Metropolitan Water District of Southern California. It presently is supplying 91 incorporated cities with a (district) population of 7.5 million, in six southern California counties. When established in 1938, the district included only 11 cities in three counties, with a 2 million population. Assessed evaluation has grown from $2 billion to $14 billion in 28 years, and the area served from 624 square miles to 4060 square miles. The District's vast aqueduct and pumping system represents an investment of nearly $400 million.

The main line of this system is the Colorado River Aqueduct. It runs 242 miles, from Parker Dam on the Arizona border to the outskirts of Los Angeles, making it the longest domestic water supply line in the United States. Selected by the American Society of Civil Engineers as one of the Seven Civil Engineering Wonders of the United States, the main aqueduct system lifts water 1617 feet over mountain barriers. It uses 92 miles of 16-ft diameter tunnels; 55 miles of concrete lined conduits; 63 miles of canals; 144 inverted siphons, totaling 29 miles in length; and two reservoirs. The distribution system includes 20 miles of tunnels, 15 miles of concrete lined canals, and seven reservoirs. Power to operate pumping and auxiliary equipment is transmitted through 321 miles of high tension lines originating at Hoover Dam.

The initial development of the Colorado River aqueduct was completed in 1941, but certain features, particularly 22 miles of siphons, were constructed to operate at partial design capacity, pending authorization for construction of a second barrel of siphons. The $200 million improvement program, finally authorized in 1952, was completed in 1960.

The Metropolitan Water District has relied mainly on the following consulting engineers for design; The Fluor Corp.; Bechtel Corp.; J. M. Montgomery; D. A. Elliott; Pereira and Assoc.; Shuirman and Assoc.; Converse Foundation Engineering Co.; V. P. Pentagoff; Richard Jahns; Julian Hinds; M. L. Dickenson; and Walter Huber.

The $1.8 billion Feather River plan will duplicate in part the services rendered by the Metropolitan Water District of Southern California, but it is designed mainly to aid cities in central California.

The West Coast

Many cities of the West depend on ground water supplies — even some that belong to the Metropolitan Water District of Southern California. As a result of population and industrial invasions, these ground supplies have dwindled steadily, causing the cities to seek new water sources and to adopt new conservation practices. Estimates of ground water overdrafts in Orange, Riverside, San Bernardino, and Los Angeles Counties total 1.5 million acre-feet. Cities within these counties, however, are supplied by the District. Other West Coast communities are not so fortunate and have no secondary supply source.

The City of Dalles, Oregon, is supplied by a gravity system from Mill Creek, some eight miles out of the city, and by wells located within the city. Because of the progressive lowering of the ground water basin, well pumping curbs were contemplated, and the firm of Cornell, Howland, Hayes & Merryfield was retained to undertake a water supply study.

Initially, a conventional water plant on the Columbia River was considered, but further study resulted in a better solution. The existing pipeline system was used to charge the existing ground water supply during the winter so it could be drawn on during the summer months. Since winter water requirements were 2-3 million gpd and peak summer requirements 9-11 mgd, the reliable river supply of 7 mgd could equalize the supply-demand seasonal variance.

On an experimental basis, the basin is being recharged by pumping chlorinated and clarified water through the transmission lines into the ground through one of the city wells. If this system proves satisfactory, the city will have increased its summertime supply with little capital cost, since the components of the recharging cycle are existing facilities. Future enlargement of this system will cost much less than new treatment or transmission facilities.

Alaska

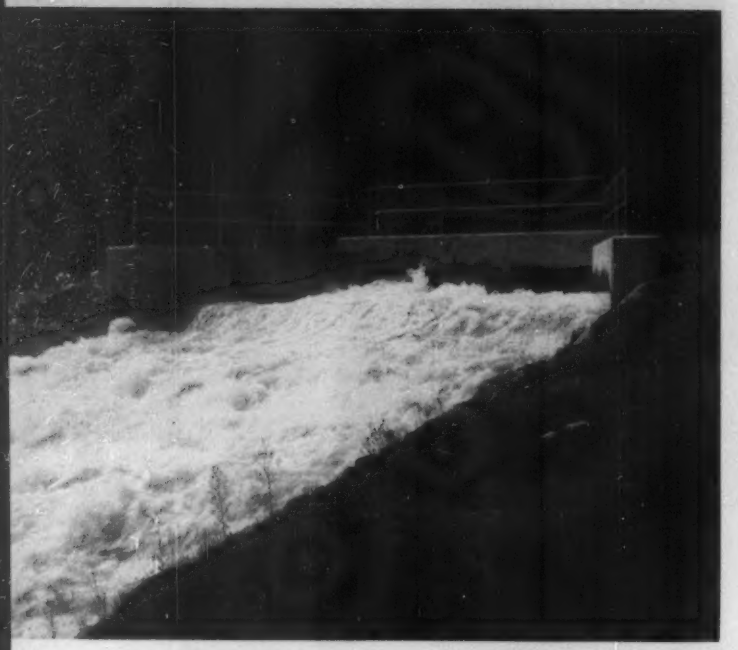
In another interesting engineering project, CHHM designed the water supply of Juneau, Alaska, using an abandoned gold mining tunnel as part of the water transmission system. The drainage tunnel, constructed about 1900, had been blocked at both ends after several abortive efforts to drain Last Chance Basin of Gold Creek. Searches of old papers and court records, plus the assistance of the City of Juneau and USGS, enabled geological, hydrological, and structural data to be accumulated without dewatering the tunnel.

Feasibility studies consisted of drilling test holes into the tunnel and pumping to determine depth,

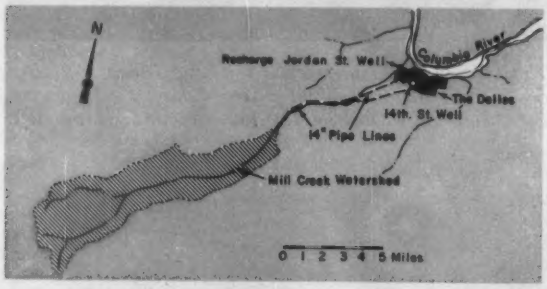
The Whitsett Pumping Station of the Metropolitan Water District of Southern California is at Lake Havasu, Cal.

The 14-million gallon reservoir for Long Beach, Cal., was designed by James M. Montgomery, Consulting Engineers, Inc. Water is treated in the low structure on the left.

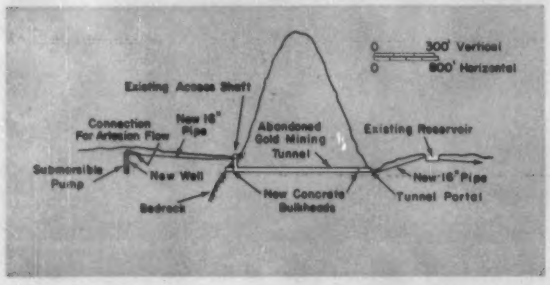
The sludge recalcining plant at the San Diego, California, Alvarado Filtration Plant recovers lime for reuse. Lake Murray reservoir, in background, is the city supply.



Bypass facilities at the Springfield, Mass., reservoir include the baffled outlet chamber (above) which is at the downstream end of a bypass water tunnel. The outlet chamber contains armored baffle plates and a cone valve designed to dissipate the energy of 400-ft of head at 120 mgd flow. It is used for removing silt from reservoir.



Although located on the Columbia river, the city of The Dalles, Oregon, uses Mill Creek and well water supplies.



Near Juneau, Alaska, a new well connected to an existing mine shaft provides economical dependable city supply.

extent of aquifer, and probable yield. Artesian pressure was found to be sufficient to provide a good portion of total demand by gravity flow. Submersible pumps in the wells, drawing water for peaking supply, are controlled automatically from the distribution reservoir supply in the city. Since the water temperature is stable, pumping operations are not hampered by freezing.

The tunnel was rehabilitated by blasting out old concrete bulkheads, dewatering, placing two new concrete bulkheads, strengthening portals, and lining with concrete. A valve was placed in the upstream bulkhead to control water flow into the tunnel.

The East Coast

On the East Coast, many cities are facing up to long existing water problems. Early this year, the engineering firms of Parsons, Brinckerhoff, Quade & Douglas and Goodkind & O'Dea completed a comprehensive preliminary plan for the development of water resources in Dutchess County, New York, which found it "feasible and in the public good" to establish a water district for present and future urban areas within the county.

Dutchess County expects a growth from its present 175,000 to over 280,000 in 1980. The direction of this growth is expected to be within the area covered by the water district, which includes over 75 percent of the total population. A less conservative Harvard University study of this county predicts a population of nearly a half million by 1985.

Present water treatment capacity is 25.4 mgd, and present average water demand runs about 18.7 mgd. Corresponding peak flows are 28 mgd, leaving a 2.6 mgd daily deficit. Demand is expected to be 33.8 mgd in 1980, and over 60 mgd 30 years hence. Peak flows for 1980 will be an estimated 60 mgd.

The study showed that only the supplies of Poughkeepsie and Beacon were sufficiently valuable for inclusion in the new water district. To forestall water shortages, a 29.4 mgd treatment plant on the Hudson River is required. This new capacity, plus the full services of a new filtration plant just being completed by Poughkeepsie, will give the district enough capacity to meet peak needs up to 1980. Hazen and Sawyer, New York consulting engineers, designed the Poughkeepsie plant.

In Massachusetts, the City of Taunton has completed a major overhaul of its municipal water system. The consulting engineering firm of Fay, Spofford & Thorndike designed the $1.6 million project.

Taunton's original supply came from a nearby lake, and was pumped through one main by steam powered pumping equipment ranging from 38 to 60 years old. There was no distribution storage facility. Pumping was maintained 24 hours a day. Despite this, a peak demand rate exceeded the system's capacity by 6 mgd.

The filter operating room at St. Cloud, Minn., water treatment plant employs pneumatically operated equipment.

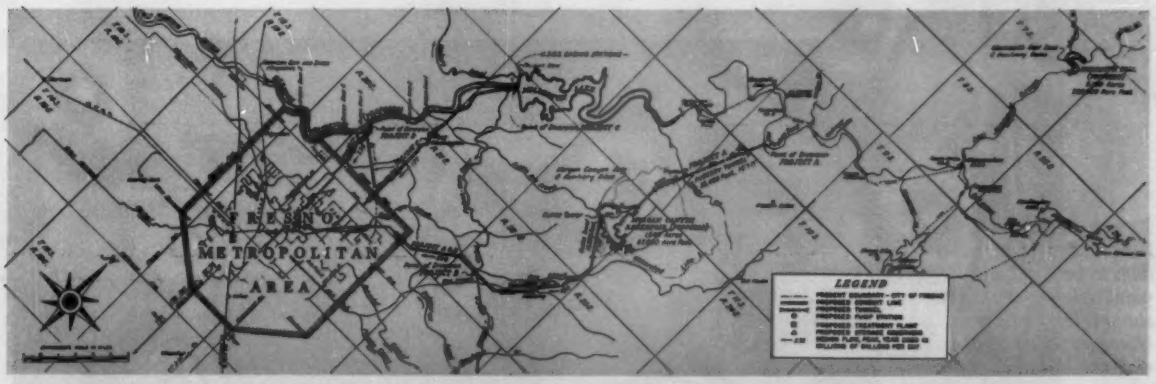
In Portland, Michigan, low pressure, inadequate peaking supplies, and undersized distribution mains caused city officials concern. R. W. Petrie and Associates, Inc., Benton Harbor consulting engineering firm, designed this watersphere to replace an 80,000 gallon standpipe (background), increasing both pressure and storage capacity. Existing wells were supplemented by a new 600 gpm well, and undersized mains in city's distribution system were replaced.

Careful construction planning allowed the steam powered pumps to be eased out and diesel powered pumps and generators to be installed without service disruption. The newly completed Prospect Hill reservoir provided the city with five days of emergency storage and uniform water pressure was achieved. The cleaning and cement lining of the main lake feed to the reservoir increased capacity 30 percent without increasing pump horsepower, and improved screening increased the reliability of the main pumping units.

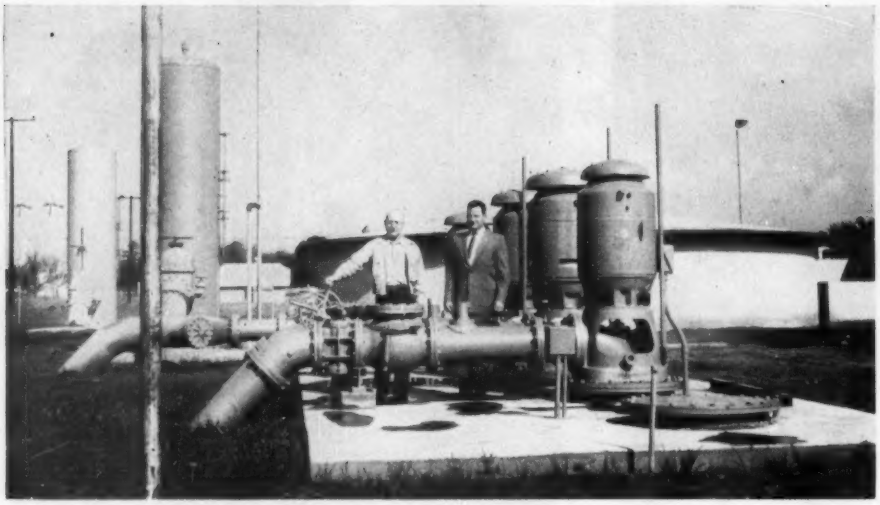
Clinton Bogert Engineers, New York consultants, solved nearby Springfield's water reserve problems by designing two, 230-ft diameter, 28-ft high, 15.5 million gallon storage tanks to supplement the city's existing reservoir supply. Billed as the world's largest prestressed concrete tanks, these structures will provide more economical water storage than the city's old rectangular tanks, and will increase Springfield's present 29 mgd, one-day storage to 60 mgd.

In 1960 Clinton Bogert completed an $800,000 bypass facility designed for the City of Springfield to

Storage tank, Rochester, Minn., one of 4 elevated storages for an electronically controlled well supply system.



Fresno, California, is fortunately located adjacent to the San Joaquin River, from which it derives its water supply.



A 7600 gpm booster pumping plant at Monterey Park Cal., is automatically controlled by telemetering system. C. F. Hustrup and Associates designed the system.

allow for the removal of flood-borne sediment from the intake reservoir. The project also provides a parallel transmission facility that will supplant the reservoir tunnel when silt is removed again.

The Midwest

In the West and Midwest, the firm of Black & Veatch has completed a number of impressive water treatment and source projects. Some typical projects are pumping stations for the City of Memphis, Tennessee; centralized well supply control for Rochester, Minnesota; a demineralizing and softening plant for Independence, Missouri; comprehensive redesign of the San Antonio, Texas water works system; development of water supplies for Colorado Springs, Colorado; and a treatment plant in St. Louis County, Missouri. It is interesting to note that four of these projects involve tapping and treating ground water supplies. Even Memphis, located on the Mississippi, has used well water for years. Dissolved iron is removed through an unusual aeration and coke filtration process developed by engineer-chemist Wellington Donaldson, in 1924. Black & Veatch has designed three of five such plants now in operation or in design.

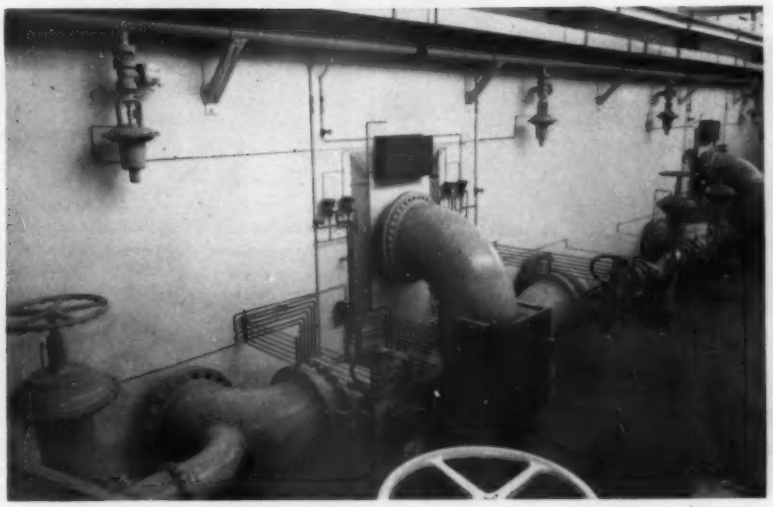
Prior to the comprehensive analysis of San Antonio's well water supply system by Black & Veatch, in 1953, new wells were drilled into the Edwards Limestone deposit, and water was pumped through a standpipe system to the grid serving the surrounding area as demand dictated. However, since 1925, this city has had an Independent Board of Waterworks Trustees that planned water development.

A $33 million program was instituted to develop ground water resources systematically and to consolidate and modernize pumping and treatment plants. A sum of $16 million was allocated for a five-year plan (1955-1960) designed to supply a population of 573,000 by 1960. This meant rebuilding plants, drilling new wells, and replacing much of the existing transmission line. Steam was replaced by electricity for pumping equipment, and supervisory electronic control is being considered.

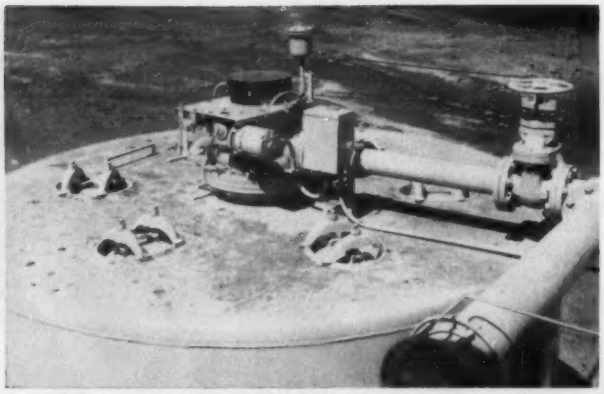
Kittery Water District, Kittery, Me., shows earth dam in background, filter plant (right), pumping station (left). Whitman & Howard, Boston, Mass., was the consulting firm.

A partial view of the spillway portion of Lake Brandt Dam, Greensboro, N. C. The project was designed by Hazen and Sawyer, New York City.

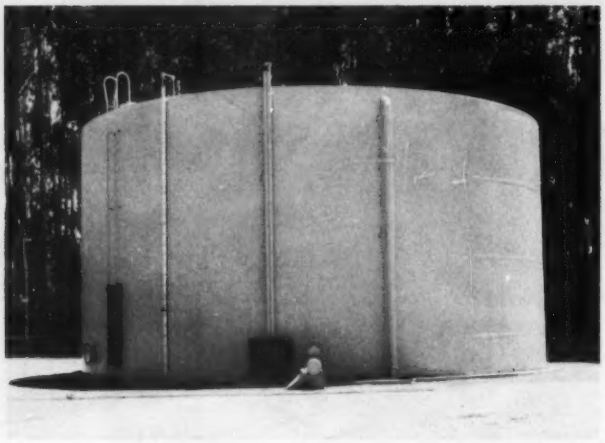
The spacious filter operating floor of the Bogota, Colombia, water treatment plant. Buck, Seifert and Jost, New York engineers, designed system.



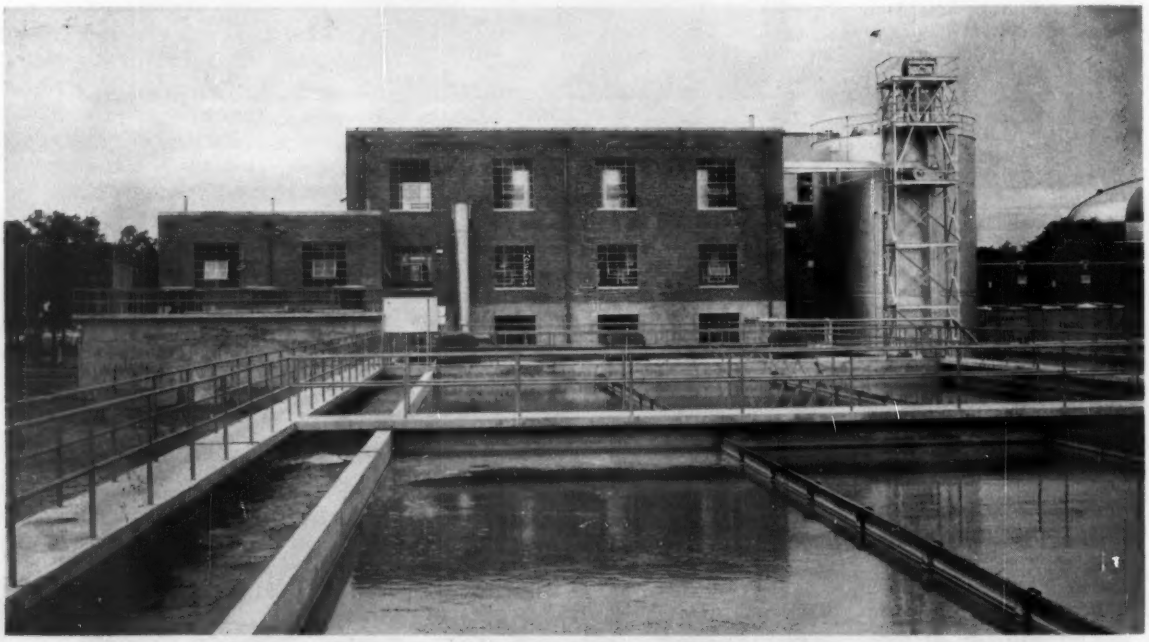
Pneumatically controlled and operated butterfly valves in the Santa Cruz, Cal., water plant designed by Brown and Caldwell, San Francisco, Cal.



A packaged 200 gpm capacity (Eimco) vertical filter unit in use at So. Dos Palos, Cal. The water treatment plant was designed by Process Engineers.



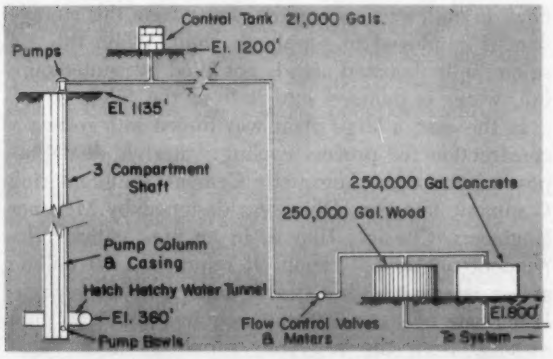
A 500,000 gallon capacity steel tank, one of 6 tanks used in the Millbrae, Cal., water system. The engineer on this project was Wilsey, Ham and Blair, Millbrae, Cal.



The Dallas, Texas, water treatment plant. Note large storage tank and conveyor system for handling bulk chemicals.

The Siletz River pumping station provides water for the Georgia-Pacific Paper Co., without violating strict state laws.

Water Processing for Industry



This water source system, designed by Wilsey, Ham & Blair, provides water for AEC plant in Livermore, Calif.

INDUSTRY uses about 150 billion of the 270 billion gpd water demand in the United States. Most industrial water users borrow water in a relatively pure state, treat it, use it in an operation, and return it to the source. The actual volume loss is small; only an estimated 3 billion gpd is consumed through processing losses or actual inclusion in the final product.

How industry uses water, and the volume it requires, vary considerably. For instance, to make a ton of steel requires 65,000 gallons of water; a ton of paper, 39,000 gallons; a quart of whisky, 20 gallons.

Industry's Problems

Water for the most elementary industrial application usually requires pretreatment, even when the source

is a public supply for human consumption. Boiler feedwater and condenser cooling are good examples of this, since both require water purity unattainable from most municipal filtration processes. It is, however, impossible to generalize on what constitutes acceptable industrial water. Total hardness, calcium hardness, total alkalinity, pH, total dissolved solids (brackishness), suspended solids (turbidity), iron content, phosphate content, silica content, chloride and sulphate content, and microbiological contamination all affect the usable quality of industrial water. In addition, oxygen, carbon dioxide, and sulphur dioxide contamination can cause interior damage to equipment, and magnetic iron oxide and complex chemical salts can cause further problems. Thus, treatment must be based on a specific water supply analysis. As a rule of thumb, it is assumed that the higher the operating temperatures and pressures involved, the purer the water supply required.

Biological contamination also may cause serious problems to industry. However, algae, fungi, slime producing bacteria, and corrosive bacteria usually can be counteracted by chlorination, deaeration, the use of microstrainers, or some combination of these.

Pharmaceutical production and other manufacturing processes requiring optimum water purity often must employ distillation processes. Distillation also may be required to provide pure water for ultrahigh temperature boilers or cooling systems.

The paper, steel, and oil industries, as well as other heavy industries, are recycling large amounts of water to reduce demands on potable water supplies. Recycling involves pre- and post-treatment of process water, with small amounts of makeup water added to counter the effects of evaporation and absorption.

One source of makeup and primary water is treated effluent from municipal sewage. To be feasible and profitable, the nature of industrial uses of this effluent must not involve public health, the sewage plant must be able to supply industrial needs, and processing and transportation costs must be less than those for procuring alternate supplies. The quality of the effluent must be consistent within tolerable limits to allow pretreatment at reasonable cost.

Effluent differs from surface ground water in that it has higher color and biochemical oxygen demand (BOD), contains more nitrogenous compounds, more dissolved solids, and sulphates, primarily from detergents. Coagulation, flocculation, and filtration usually will remove undesirable color and suspended solids, and prechlorination will destroy much of the BOD. However, large quantities of detergents in sewage may interfere with process efficiency.

Conflicting Claims

Industrial consumers of large quantities of water, particularly the paper and pulp industries, have been faced with serious conflicts over claims to local water supplies. An example is the problem faced by the Toledo, Oregon plant of the Georgia-Pacific Paper Company. Cornell, Howland, Hayes & Merryfield, Corvallis, Oregon, consulting firm, was required to apply unusual design concepts based on carefully balanced hydrology to provide this plant with a 10 mgd supply.

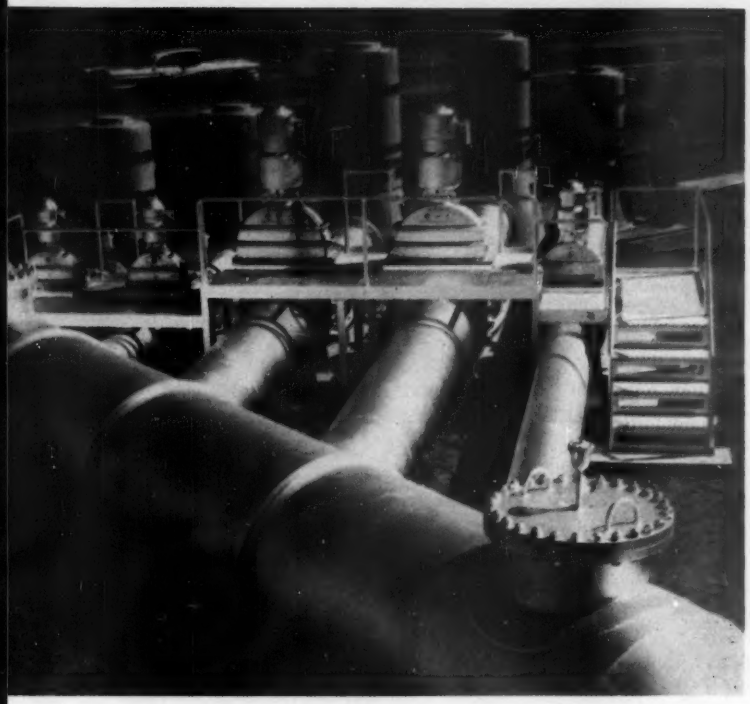
The mill is located on the Yaquina River which, despite its 250 square mile drainage basin and 40 to 80 inches per year area rainfall record, will run less than 6 mgd in a dry year. In addition, low flows are accompanied by salt water intrusion to 10 miles above the mill. Near the mill, Olallie Creek enters the Yaquina, and during seven months of the year, this stream can provide the mill's supply. However, it is also affected by salt water intrusion above the mill site. Seven miles north is the Siletz River with a minimum flow of 32.3 mgd. This stream is protected by the State of Oregon against water diversion when the flow at the diversion point is less than 100 cfs in October, November, and December, or less than 75 cfs during July, August, and September. A hydrographic study covering 35 years of flow was made, with 1952 determined as being the critical year for minimum flows for the streams involved.

Design Solution

Based on the studies, the subsequent design solution was to supply the mill from behind a salt water barrier near the mouth of Olallie Creek during the winter months. This barrier provides for overflow of water in excess of mill demand and provides a ladder for up-stream-bound fish, but does not permit salt water intrusion, with upstream levels fluctuating between minus 1 and plus 5, and downstream levels varying between minus 1 and plus 9. The pond behind the barrier provides operating storage.

When insufficient flows in Olallie Creek lower mill supplies, and the Siletz River flow permits diversion of water, water is pumped over a 200-ft divide into a storage reservoir at the head of Olallie Creek. When flows in both streams are low, water from this storage dam is employed to supply the mill. When this 1.4 square mile dammed area is not filled by winter rainfall, water is pumped into it from the Siletz River.

In the east, a large plant was forced into reservoir construction for process cooling water. A dual purpose plant for the Marquette Cement Manufacturing Company, Superior, Ohio, was designed by Meissner Engineers, Chicago, Illinois, in an area entirely dependent on rainfall runoff. It required a 30 million gallon reservoir with an earth dam. A tower recirculating rate of some 500 gpm requires about 80 gpm makeup from the reservoir, supplied via a 72-in. diameter gravity flow main. A filtration plant also draws from the reservoir for drinking water.



Five electrically-driven turbine pumps provide a total pumping capacity of 150 second-feet for the San Luis Water District, California.

Conservation And Recreation

ALTHOUGH Federal flood control, power generation, irrigation, and water conservation projects are on the rise, many municipal and regional water agencies are constructing such projects without Federal aid or with limited Federal subsidization. These projects often include much desired recreational facilities.

On the East and Gulf Coasts, many local flood control or combination water supply-flood control projects are being undertaken. The experience of disastrous flooding due to hurricane storms, coupled with constant encroachment on flood plain areas, makes such projects imperative. In addition to reducing flood damage, these projects create additional water reserves, water recreational areas, and supplemental stream waters in periods of low flow. The last is especially important for effective pollution control.

Off-Stream Storage

The design of the off-stream storage facility for the Passaic Valley Water Commission, proposed by Clinton Bogert Engineers, New York City, is an example of a multipurpose water supply-flood control work. The Commission serves the cities of Clifton, Passaic, and Paterson in Passaic County, New Jersey.

The $5.2 million project (less land cost) involves the construction of a pumping station on the Pompton River and a storage dam eight miles above the present Paterson treatment plant on the Passaic River. The system is designed to pump water from the Pompton River, when its flow exceeds 137 cfs, through 1½ miles of 42-in. pipeline into the storage reservoir. During periods of low flow, water will be released through the conduit to the river to help maintain minimum flow in the Pompton and Passaic Rivers. The storage system will help to conserve water now lost in flood stages of the river, and at the same time protect downstream communities. The completed storage will have a surface of 465 acres.

In the State of Mississippi, the joint engineering venture of the Lester Engineering Company of Jackson, Mississippi, and the Harza Engineering Company of Chicago designed the Pearl River Valley reservoir, near Jackson, for both community water supply and recreational uses. A 31,000-acre lake formed by a three-mile-long dam on the Pearl River will provide more than adequate flow for up to 40 years.

The combined water supply-recreational use of the $19.8 million project has been well studied. A dependable water supply has been created from an otherwise unreliable river source, and the economic benefits from recreational and commercial use of the artificial lake are thought to be nearly as important as the water storage. Similar recreational facilities are not available within 110 miles, and future tourist trade

and commercial activity will greatly enhance area property values. The project also will improve wild life conservation programs, curb direct water pollution, and may encourage commercial fishing.

On the outskirts of the City of Jackson another interesting project recently was completed, involving the creation of a multipurpose lake for industrial, conservation, recreational, and flood control purposes. In 1957, the Mississippi Power and Light Company developed plans for expanding the capacity of their Rex Brown plant from 155,000 kw to 400,000 kw to serve the expanding area. Ground water fed to cooling towers had served the plant in the past, but the increased demand on wells caused by the expansion would have jeopardized area ground water supplies.

Through the formation of an unusual quasi-public corporation, a section of land reserved for use or benefit of the schools of the area was made available for a reservoir site. Water to fill the lake was procured from a pumping station on the Pearl River six miles east of the reservoir. The scheme permitted expansion of the power plant at virtually no sacrifice to the public interest, since the former use to which the site was put did not approach its economic value as a reservoir.

The resulting $1.6 million project, designed by Michael Baker, Jr., Inc., engineers, Jackson, Mississippi, developed some 6000 acre-feet of storage, filled by a pumping system capable of delivering 8 million gallons per day. Since most of the storage is pumped, spillways are not required — when the reservoir is full, pumps are stopped.

The project allowed electrical power to be developed more inexpensively, forestalled serious depletion of ground water, increased revenues to the school system through profitable water rentals, provided a recreation spot close to town for water sports, improved the appearance of the area, and reduced flash flooding from a creek now part of the reservoir.

Irrigation

The Western states have a different problem with water: how to get more for their growing population and for agriculture. One project undertaken to solve this problem was the development of a water distribution system to irrigate 20,000 acres in the San Luis Water District, Los Banos, California. Modest for California, this project involved the construction of two large pumping stations, large diameter steel pipelines, and 23 miles of earth canals. The water source was the Delta-Mendota Canal of the Central Valley Project of the U. S. Bureau of Reclamation.

The firm of Stoddard and Karrer, Los Banos, California, located the primary pumping station on the canal about 10 miles southeast of Los Banos. This station pumps water through 63-in. diameter steel pipe for over 1½ miles, and discharges it into an earth canal. The canal proceeds southwesterly for some 11 miles to a second earth canal. This runs about 12 miles southeasterly to the improvement district. The total water lift from the source is about 325 feet. The engineers report that this system has operated satisfactorily since it was put into operation in early 1960.

Legal Battles

Irrigation projects frequently encounter legal difficulties in California and other Western states. The San Joaquin River, for example, was the subject of a dispute involving riparian and overlaying landowners, city irrigation districts, the State of California, and the Bureau of Reclamation. The trouble started when the Bureau of Reclamation designed the Friant Dam on the San Joaquin River. The dam threatened to impound and divert waters of the stream that were necessary to irrigate lands downstream of the dam. This dam, a vital element in the Central Valley Project of California, was approved by the California State Legislature in 1933, begun in 1939, and placed in operation in 1949.

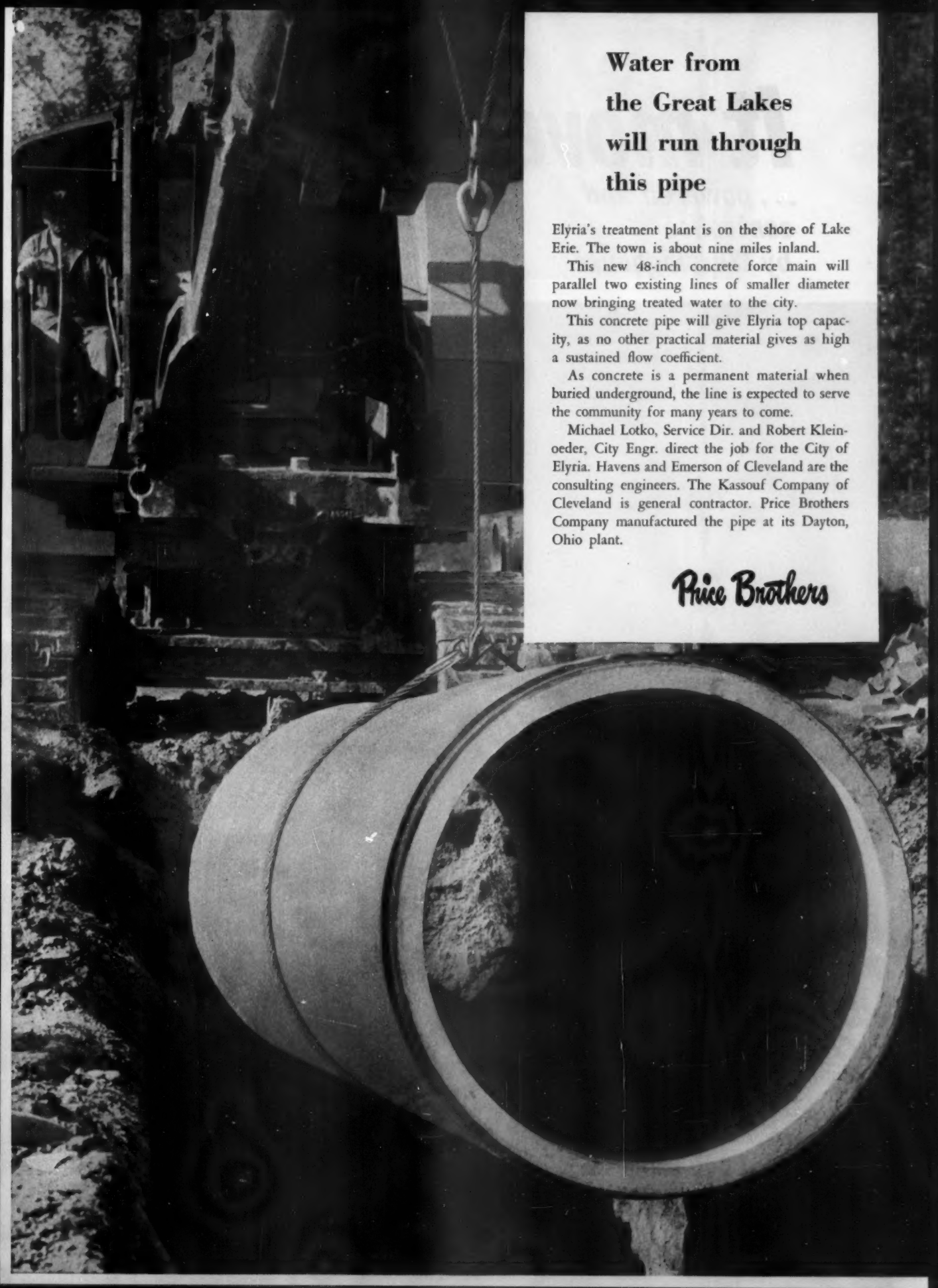
In 1947, 13 riparian and overlaying landowners filed suit against the U. S. Secretary of the Interior, officers and employees of the Bureau of Reclamation, and ultimately against 14 irrigation districts benefiting from the Central Valley Project.

The ensuing trial took 210 court days, during which time the San Francisco consulting firm of Lee and Praszker served as the plaintiffs' engineering consultant and professional witness. Plaintiffs requested full flow of the river initially, but during the trial sought to have amounts of water released from the dam representing their reasonable share of the water diversion. Bearing on this request, they proposed a judgment requiring a "physical solution."

The court accepted the plaintiffs' solution and ordered all parties to submit plans for physical solutions in advance of trial. Plans prepared by Lee and Praszker in collaboration with consulting engineer O. W. Paterson were selected as the final solution and ordered to be constructed and operated at government and/or contracting district expense.

The plans involved the maintenance of a water surface elevation in the San Joaquin equal to original river level before storage in the Friant Dam, and water levels were to be kept high enough to prevent irrigation pumps from sucking air or sand. Also, the "solution" was to maintain stream width and depth, and ground water supply equivalent to conditions of natural stream flow. The length of stream affected was 50 miles, between Friant and Mendota Dams.

The completed system, including 14 adjustable dams, is estimated to cost over $1 million, and the annual cost of operation is estimated to be $4000. Friant Dam cost $22 million, and two diversion canals, Madera and Friant-Kern, $62.7 million. ▲▲



Water from the Great Lakes will run through this pipe

Elyria's treatment plant is on the shore of Lake Erie. The town is about nine miles inland.

This new 48-inch concrete force main will parallel two existing lines of smaller diameter now bringing treated water to the city.

This concrete pipe will give Elyria top capacity, as no other practical material gives as high a sustained flow coefficient.

As concrete is a permanent material when buried underground, the line is expected to serve the community for many years to come.

Michael Lotko, Service Dir. and Robert Kleinoeder, City Engr. direct the job for the City of Elyria. Havens and Emerson of Cleveland are the consulting engineers. The Kassouf Company of Cleveland is general contractor. Price Brothers Company manufactured the pipe at its Dayton, Ohio plant.

Price Brothers

It moves

. . . powered and controlled by Westinghouse

Press a button—an indoor auditorium becomes an open air stadium in 2½ minutes—and behind that button is an unparalleled story of engineering and construction cooperation.

Architectural and engineering teamwork has given Pittsburgh the world's first movable roof auditorium. This versatile structure adds to the city's renaissance, in one building, a 14,000 seat sports arena, a convention hall, open air amphitheater, and an exhibit center. Westinghouse products bring the facilities to life, give precision control for the delicate manipulation of six 300-ton movable leaves.

Outwardly, the new auditorium is a 400′ stainless steel

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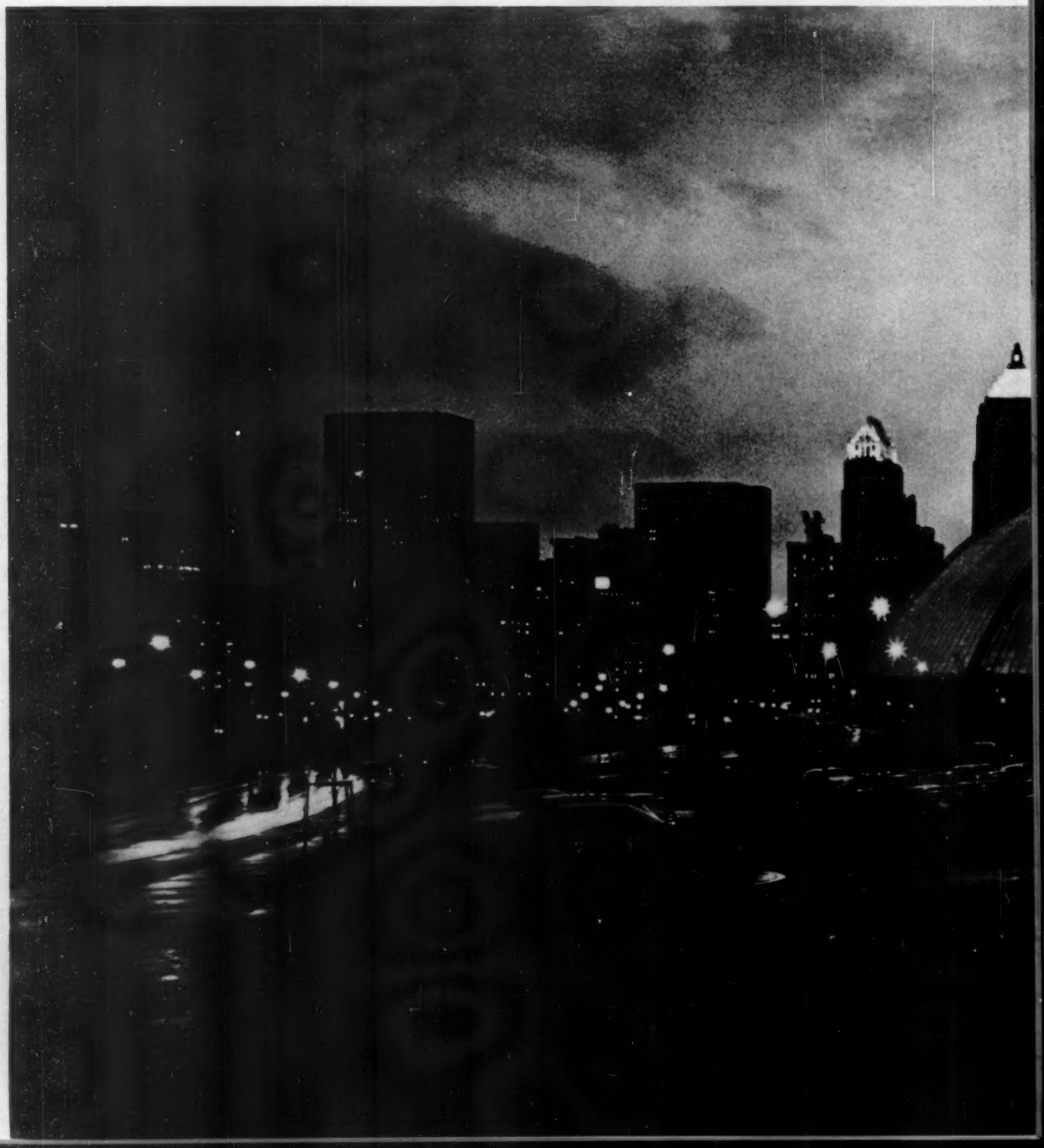
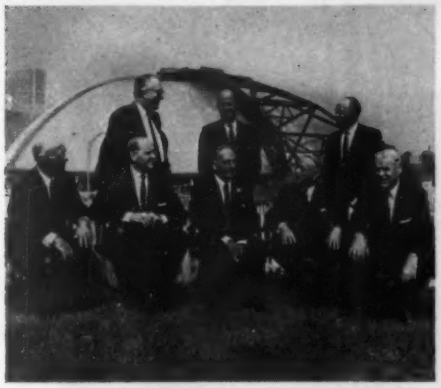


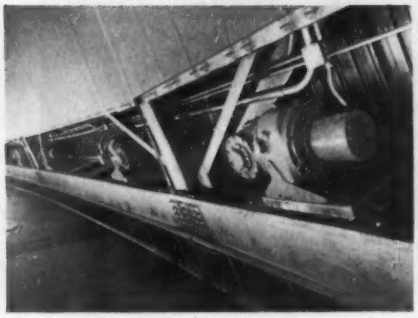
umbrella, suspended from a space frame cantilevered from the ground. That is one outstanding construction teamwork story.

Inside, coordination culminates in a control console located high above the seating area. From this station the



J-94176-2

Construction Motivators: The Authority & Industry
l to r seated: Judge A. L. Wolk, Vice Chmn.; N. Stabile, Sec'ry Treas.; W. B. McFall, Chairman; H. R. Edelman, Jr., Pres. Heyl & Patterson; and D. J. McDonald, Vice Chmn.
standing: C. B. Jansen, Member; J. E. Payne, V. P. Westinghouse; and Edw. Fraher, Exec. Director



The six movable roof leaves are driven by Westinghouse right angle gearmotors, five to each leaf. Photo shows base of one of the movable leaves with the acoustic ceiling panels removed.

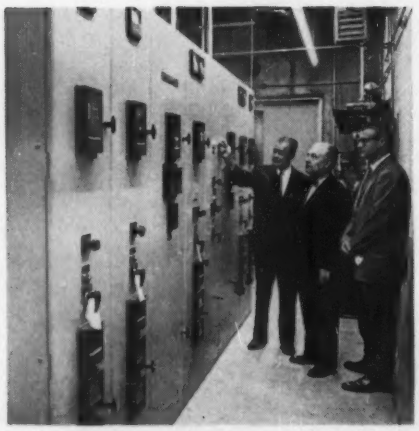
O. M. Newman, Heyl & Patterson, and Edward Cohen, Ammann & Whitney, discuss roof electrical drive with C. G. Falkenstein, Westinghouse, kneeling in front of main roof reactor control cabinet.

unique movable roof drive system is activated. An AC reactor control scheme keeps all six movable leaves in step throughout open and close cycles. Each leaf is driven by Westinghouse Moduline® gearmotors, with opposite leaves being operated in pairs.

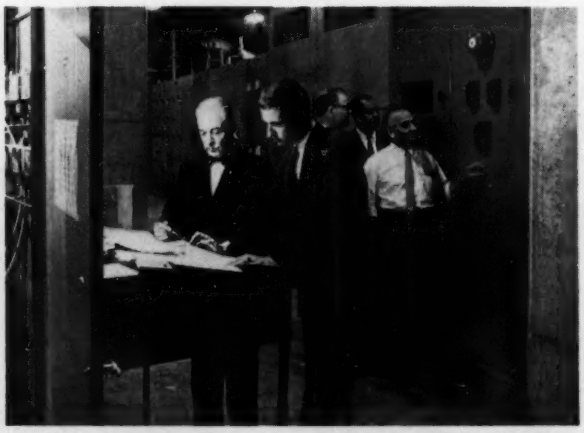
Close cooperation among architects, engineers, owner, contractors and Westinghouse helped to provide a system flexible enough to serve varying building demands, with the high degree of electrical reliability required.

For more complete information on the electrical aspects of construction, write to: Westinghouse, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-94176-3

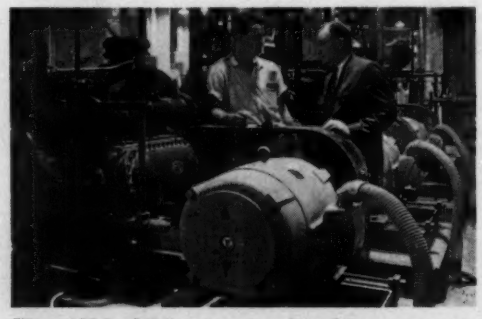


5KV metal-clad switchgear contains a tie-breaker to provide emergency switching between two incoming 4160-V lines. Seen here: N. J. Grady, V. P., Ernst, C. J. Long, and A. B. Janaszek.

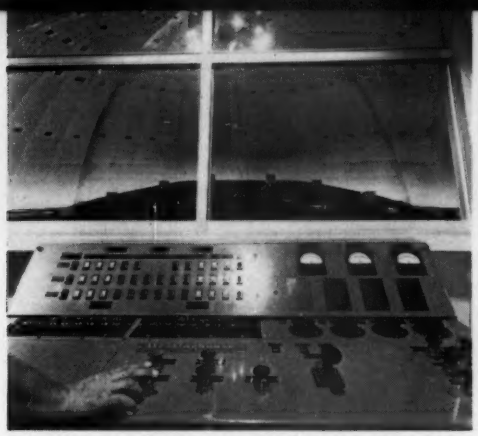


Checking construction progress are C. J. Long and F. J. Sarknas, Westinghouse. In background, 1500 kva power center supplies power for building auxiliary and air conditioning compressor motors.

Westinghouse Motor Control Center located in the Mechanical Room centralizes auxiliary motor controls. Discussing installation advantages are H. R. Helvenston, C. J. Long and N. J Grady.



Three 125 hp Lifeline A motors drive freon compressors to chill brine supply for ice rink piping. Seen here are P. F. Schad, Limbach, and C. G. Falkenstein, Westinghouse.

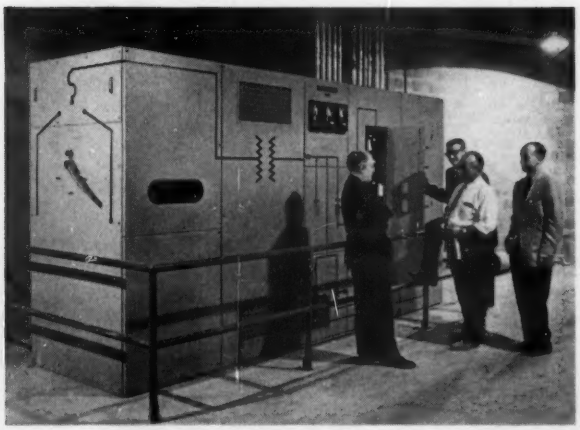


Operator's view from roof control console high above the spectator area. Visible through the glass front is the juncture of the first two movable leaves of the roof.

One of main power transformers rated 2500 kva at 11.6 kv to 4160 volts. Discussing the power supply are C. J. Long, Electrical Engineer, M. A. Geffel, Ernst, and A. B. Janaszek, Westinghouse.

Builder: Public Auditorium Authority of Pittsburgh & Allegheny County: *Resident Engineer & Supt. of Construction:* H. Rey Helvenston
Architects: Mitchell & Ritchey, Pittsburgh
Roof Designers & Engineers: Ammann & Whitney, N.Y.
Electrical Engineer: Carl J. Long & Associates, Pittsburgh
Mechanical Engineer: John Mullin & Associates, Pittsburgh
General Contractor: Dick Corporation, Large, Pa.
Electrical Contractor: E. C. Ernst, Inc., Pittsburgh
Mechanical Contractor: Limbach Company, Pittsburgh
Drive System Contractor: Heyl & Patterson, Inc., Pittsburgh

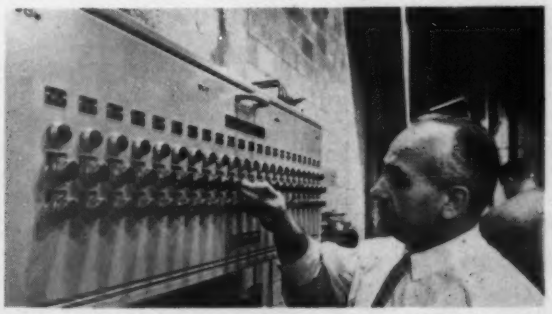
Westinghouse



Another Westinghouse power center, this 300 kva ASL dry type supplies lighting and auxiliary power. Discussing its component parts are C. J. Long, A. B. Janaszek, M. A. Geffel and Albert Simon, Ernst.

Type M Electric Stairway transports 8,000 persons /hr. Top to bottom: E. R. Gallagher, supervising architect; H. R. Helvenston, resident engineer; and A. Simmonds, Westinghouse Elevator.

Fan room equipped with series 8000 Air-Foil centrifugal fan and air conditioning coils. W. Y. Humphreys, Westinghouse, with John Mullin, Consulting Engineer, air conditioning and ventilation system designer.



Westinghouse mercury vapor parking area and floodlighting are operated from this remote control panel located in the mechanical room. M. A. Geffel, Ernst, tests lighting circuits.

J-94176-4

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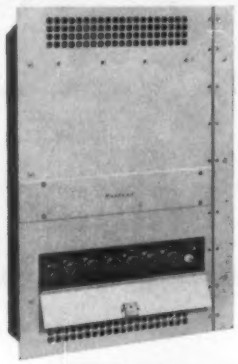
Exclusive New 30-Watt
IN-WALL AMPLIFIER

permits inconspicuous, space-saving mounting for any permanently installed Sound System . . . no longer any need to specify an amplifier on an open shelf



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NEW FLUSH DESIGN

Installs flush in frame or masonry wall; only 4" depth required. Entire amplifier is mounted on heavy-aluminum hinged door for easy servicing. Controls are accessible through key-locking hinged front panel. Backbox has ¾" knockouts.

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Advanced audio circuit uses 12 transistors and a Zener Diode; no tubes; 4 low impedance microphone inputs are provided for full 30 watts of clean, crisp audio power. Ruggedly designed and built; well-ventilated for continuous 24-hour operation.

This brilliant new amplifier design is ideal for use in auditoriums (mounted to rear of audience), for gymnasiums, or wherever a permanently installed sound system is desired.

Rauland

ASK FOR **Specification Sheet giving detailed description of the Model 2030 In-Wall Amplifier.**

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The Position Paper

The Coordinating Committee's Policy Statement on Government Engineering

FOR THE FIRST TIME, consulting engineers have an official and uniform attitude toward government engineering. The Coordinating Committee, representing the American Institute of Consulting Engineers, the Consulting Engineers Council, the American Road Builders' Association Engineering Division, the American Society of Civil Engineers, and the National Society of Professional Engineers, has released its Position Paper.

This policy statement has received the endorsement of CEC, the Institute, and the ARBA Engineering Division. The ASCE and NSPE boards did not adopt it, pointing out that they already had policies covering the situation.

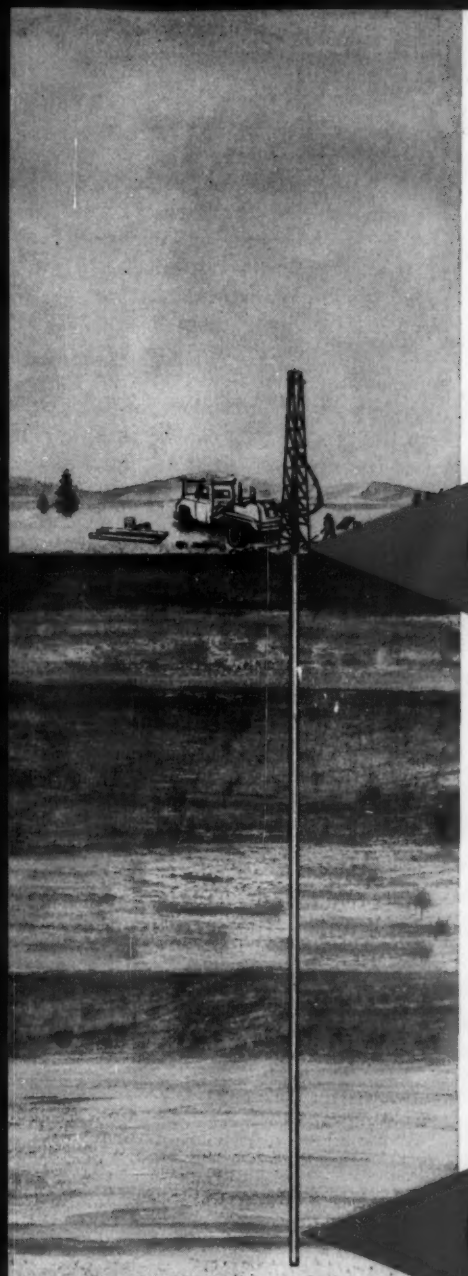
"Engineers in the employ of government, educational, or other nonprofit institutions constitute a vital segment of the engineering manpower resources of the nation. The balance of the engineering resources of the country is comprised of the equally vital pool of engineering employees and principals of private enterprise concerns. The latter group includes the human and other resources of firms [that are engaged] in the private practice of engineering – traditionally, but now somewhat less aptly, called consulting engineers.

"Under the American concept, the engineering needs of government historically have been obtained through combined utilization of publicly-employed engineering staffs and engineers in private enterprise, the services of the latter being procured through appropriate contracting procedures between government and professionally-qualified private concerns. There have been imperfections in the application of this well-established dual source of engineering for government; there are no imperfections in the theory. It has been the sheer lack of information or of simple understanding, rather than the imperfections of application, that has somewhat disturbed the wholesome relationship between public and private engineers and their respective adherents. Recurrent criticism and discussion of engineering costs and practices on publicly-financed undertakings of local, state, and Federal governments have clouded rather than clarified the basic issue on how the engineering needs of government can best be satisfied. Sharp differences based on unwarranted conclusions are inimical to both the public and professional interest.

"The engineering needs of all levels of government have increased phenomenally during the past two decades. The outlook is for continued increase. These needs must be met by the effective use of the total available reservoir of engineering manpower, consisting of engineers in government and engineers in private enterprise.

"Based on the foregoing and other relevant considerations, the Coordinating Committee therefore resolves that:

"(1) Private enterprise is the basic, traditional foundation of the



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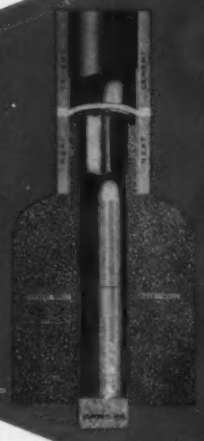
Water



The Layne Gravel Wall Well is an example of Layne experience, engineering and research. This gravel packing and 134 shutter screen employment affords larger screen openings, reduced friction, reduced draw down and pumping head. It increases specific capacity and makes for more effective retention of native sands. For additional information write for bulletin 900.

From top to bottom, you can depend on Layne for the most complete water service in the industry. This complete service provides undivided responsibility for the delivery of water . . . of the quality and in the quantity required. Over 75 years of *growing* service gives the skill and technical know-how which makes Layne First in the field of water. For additional information write for bulletin 10.

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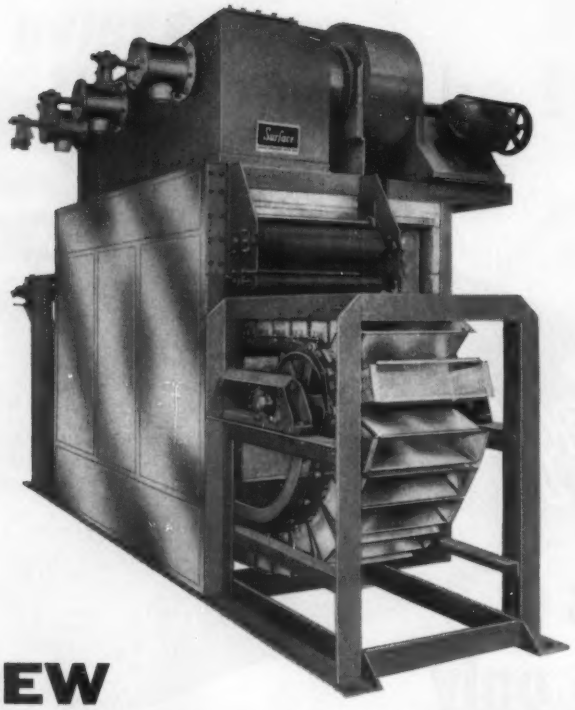

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American way of life and must be preserved and encouraged.

"(2) Government should govern, not compete with its citizens.

"(3) The following stated policy of the Federal government is a sound policy for government at any level: '. . . the Federal government will not start or carry on any commercial-industrial activity to provide a service or product for its own use if such . . . can be procured from private enterprise. . . .

"(4) Engineering for government at all levels is best accomplished by the effective use of the professional skills and experiences of engineers both in private practice and in government service.

"(5) Staffing of public agencies for engineering purposes beyond reasonable levels necessary to insure continuity, effective planning, administration, and control of public works projects is unwarranted.

"(6) In the national interest, a healthy reservoir of engineering talent in all its branches must always be maintained so that in emergencies sufficient engineering manpower can be immediately organized to design and oversee construction of vitally essential military facilities and public works. Recent wars have demonstrated the inestimable value of the rapid availability of thousands of competent engineers in private practice.

"(7) The expanding economy and technology of the nation are dependent upon expansion of the many elements of private enterprise. Government policies should provide a healthy atmosphere for development, expansion, and maintenance of private enterprise in engineering . . . [and other areas].

"(8) Governmental agencies should contract for engineering services with highly-qualified engineers in private practice, consistent with the public interest, national security, and continuity of governmental programs and the requirements for quality, safety, overall economy, and [the] time-benefit relationships." ▲▲

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Performance proves it, year after year—you can count on Powell Valves to help you solve the toughest flow control problems of temperature and pressure found in power plants today.

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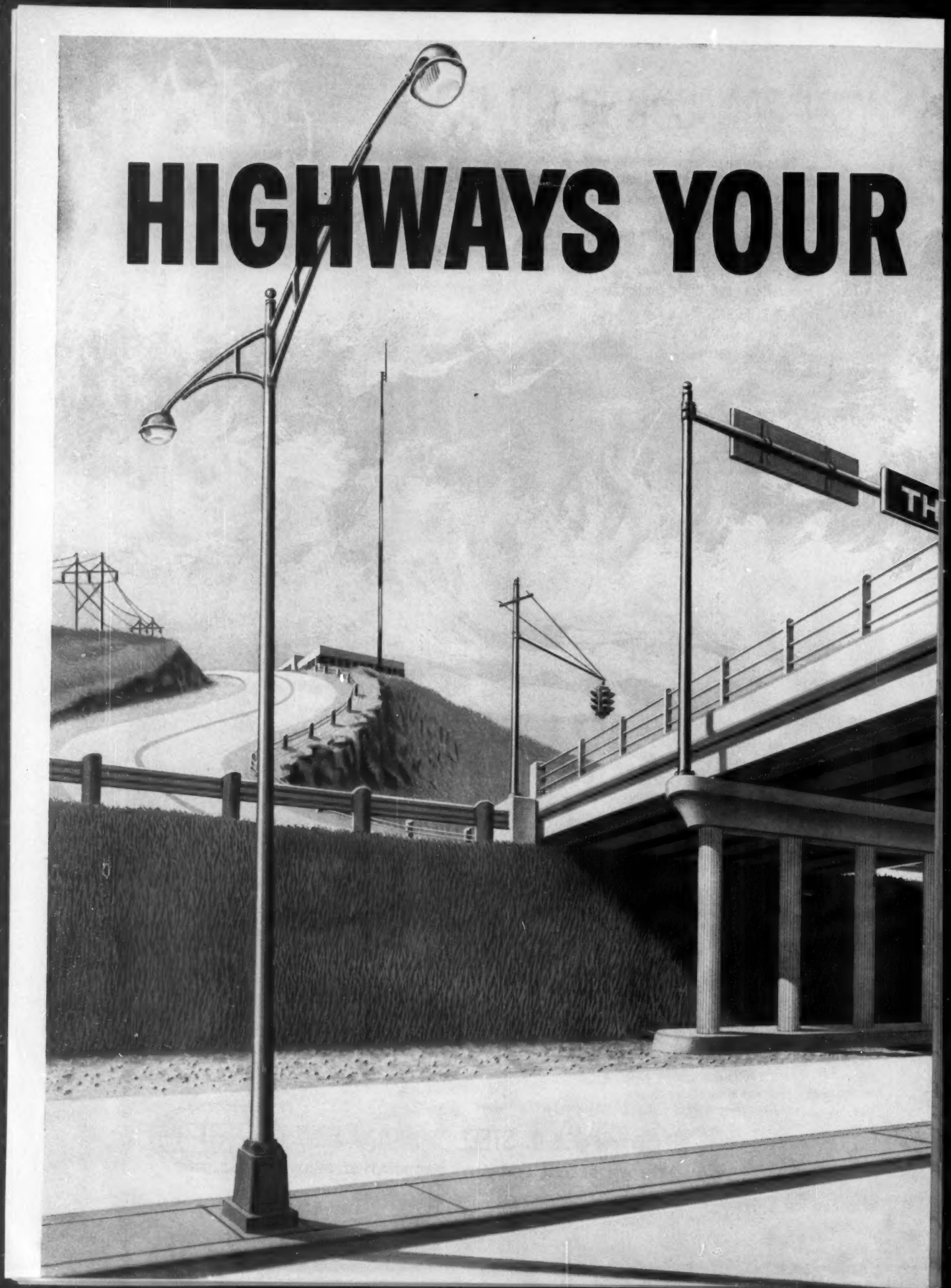
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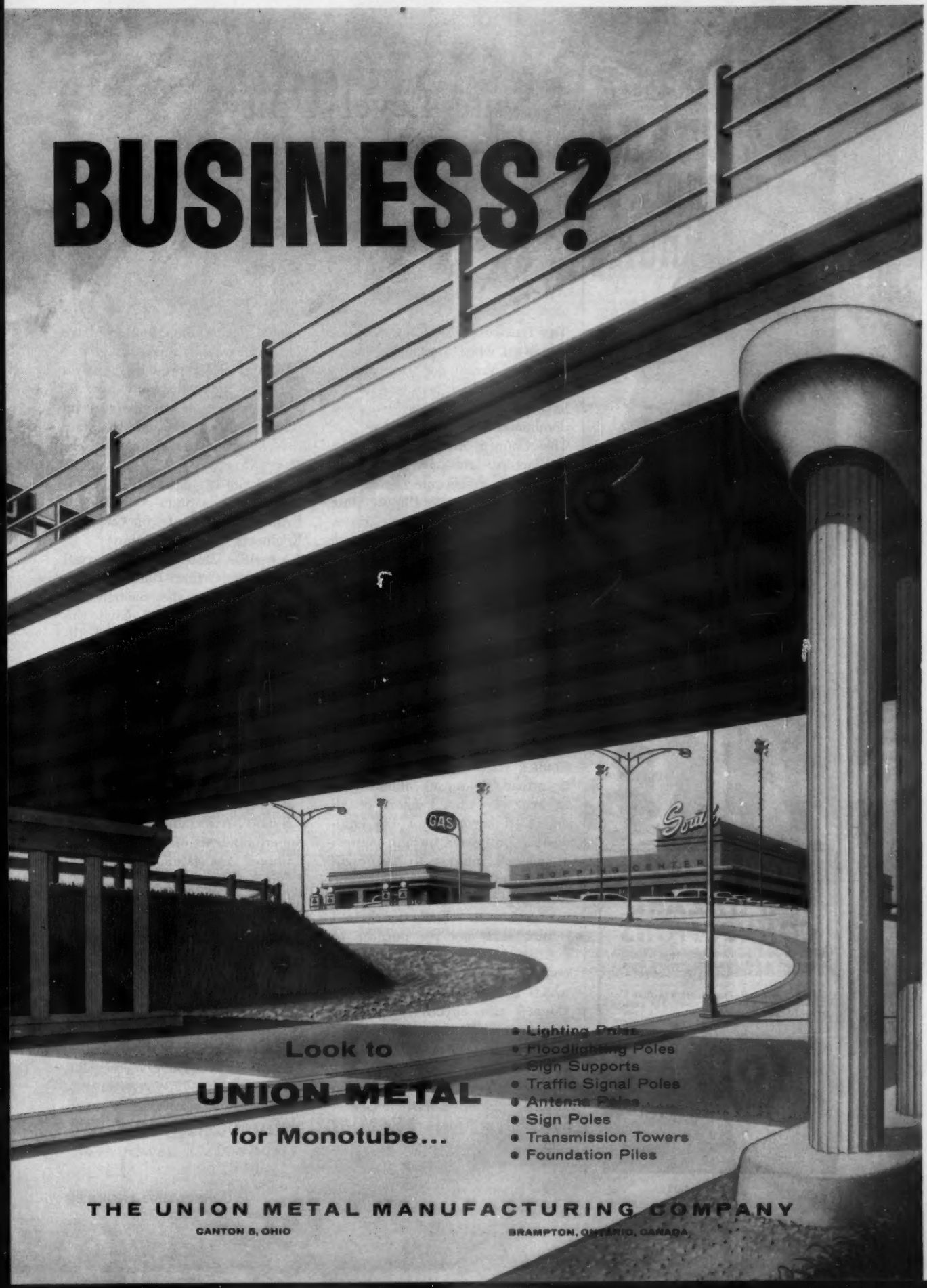
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LONG ISLAND CITY 1, NEW YORK

State Level Unity . . .

Has the Approach of the Illinois Engineering Council Solved the Problem?

THE ILLINOIS Engineering Council was born when a group of eager engineers almost got themselves a state registration law that would have put the profession under the domination of the labor unions. The Council managed to get a satisfactory law passed in 1941, which was to become effective in 1943. However, the Illinois State Supreme Court eventually threw this law out, and it was not until 1945 that an effective and legal registration law was put on the books. Since that time, IEC has made many contributions to the advancement of the engineering profession and to the protection of the public health, safety, and welfare — on the legislative front and elsewhere.

In a brochure published in July 1958, the Illinois Engineering Council states that its purpose "is to provide a means of bringing to bear the united effort of all organized segments of the engineering profession on any matters of general interest to the engineering profession and the public welfare, where such united action is necessary to achieve the desired results. It is not the purpose of the Illinois Engineering Council to engage in or develop activities which a Member Society of the Council can effectively perform without prejudice to the best interests of the entire [engineering] profession."

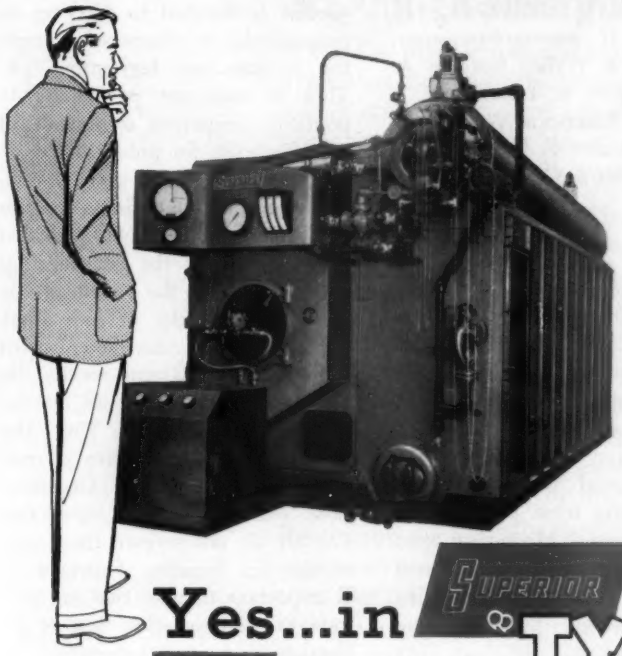
IEC tends to be more interested in results than in publicity. Hence, most of its activities are not widely known, even though they have been remarkably successful.

While IEC represents unity in only one state and only one activity, its list of members is an impressive example of the fact that unity can be achieved. Here is the list:

¶ American Association of Engineers (Illinois State Assembly)
¶ American Institute of Chemical Engineers (Chicago Section)
¶ American Institute of Electrical Engineers (Central Illinois, Chicago, and Illinois Valley Sections)
¶ American Society of Civil Engineers (Central Illinois and Illinois Sections)
¶ American Society of Mechanical Engineers (Chicago Section)
¶ American Society of Tool & Mfg. Engineers (Chicago Section)
¶ Chicago Association of Consulting Engineers
¶ Illinois Association of Consulting Engineers
¶ Illinois Association of County Superintendents of Highways
¶ Illinois Association of Highway Engineers
¶ Illinois Society of Professional Engineers
¶ Illuminating Engineering Society (Chicago Section)
¶ Institute of Traffic Engineers (Midwest Section)
¶ Society of Women Engineers (Chicago Section)
¶ Western Society of Engineers.
¶ American Nuclear Society (Chicago Section)

The present executive committee consists of H. Verne Loeppert,

are the Tube-Holes Serrated?



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While more positive boiler-fabricating techniques and improved methods of boiler-water treatment have alleviated the problem of caustic embrittlement in water-tube boilers, it is still a serious problem.

Realizing that caustic embrittlement is a problem, Superior Combustion Industries has designed its Type D Boiler with serrated tube-holes . . . a feature (see illustration) which guards against tube-leakage, one of the prime factors contributing to embrittlement.

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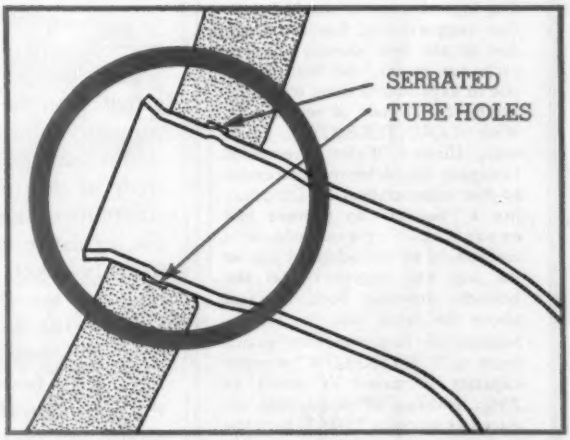

In this cross-sectional drawing of Superior's serrated tube-hole, you can see how rolled joint is made stronger by expanding the tube into the serration.

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president, Boyd Wagner Company; John P. Gnaedinger, 1st vice president, Soil Testing Services, Inc.; A. L. R. Sanders, 2nd vice president, Hazelet & Erdal; George L. Farnsworth, Jr., secretary-treasurer, Farnsworth & Wylie; Norman A. Miller, Sargent & Lundy; O. J. DuTemple, American Nuclear Society; and Walter E. Hanson, Walter E. Hanson & Company.

Tax Status

On January 4, 1960, IEC's pleasant atmosphere of unity was broken by the withdrawal of the Chicago Section of the Institute of Radio Engineers. In the Institute's letter of resignation, W. B. McClelland, secretary, stated ". . . IRE headquarters policy as stated in the Section Manual with regard to IRE refraining from participation in any kind of lobbying or open interest in legislation was in direct opposition to statements in 'IEC, Its Organization, Purposes, and Accomplishments.'"

The withdrawal of IRE, together with the fact that other member societies had from time to time expressed some concern about the possible implications of legislative activities on the tax status of their parent societies, made it appear desirable for IEC to make a detailed study of this matter. Although its constitution does not specifically list legislative activities as one of its main objects, there is no question that the Illinois Engineering Council has been active in this area. However, all legislative efforts have been directed toward the promotion of the public health, safety, and welfare.

Section 501 of the Internal Revenue Code of 1954 provides that certain organizations shall be exempt from taxation — if they meet certain qualifications.

Under Subsection (c) (3), corporations and foundations organized and operated exclusively for scientific, testing for public safety, or educational purposes are exempt; provided (1) That no part of the net earnings thereof inures to the benefit of any private shareholder or individual; (2) That no substantial part of the activities thereof is devoted to carrying on propaganda, or otherwise attempting to influence legislation; (3) That it does not participate in political campaigns on behalf of any candidate for public office.

Subsection (c) (6) gives a similar exemption to business leagues not organized for profit; provided that no part of the net earnings thereof inures to the benefit of any private shareholder or individual.

Organizations classified under Subsection (c) (3) can receive donations and gifts that are tax deductible to the donor. They also are privileged to receive a real-estate tax exemption. Organizations classified under Subsection (c) (6) do not receive these particular tax benefits. However, it is important to note that an individual's dues to either type of organization are tax deductible.

The Constitution of the Illinois Engineering Council states "Nothing in this Constitution and Bylaws shall affect in any way the autonomy of any member organization." The basic purpose of IEC is to provide a means of bringing united effort to bear on matters of general interest to the engineering profession, which would be to the benefit of general public welfare.

Inquiries and Opinions

Several executive secretaries of national engineering societies were asked to express their viewpoints on the reasons for withdrawal given by the Chicago Radio Engineers. These national organizations included the American Society of Civil Engineers, The American Institute of Chemical Engineers, and the American Nuclear Society, Inc.

William H. Wisely, executive secretary, ASCE, in a letter to Walter E. Hanson, president, IEC, summarizes his viewpoints as follows:

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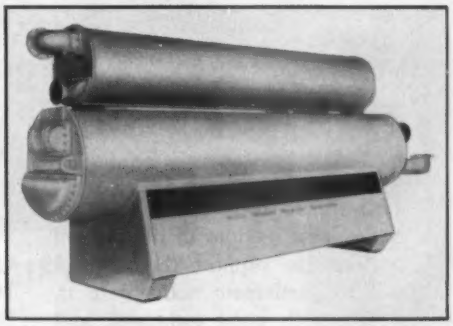

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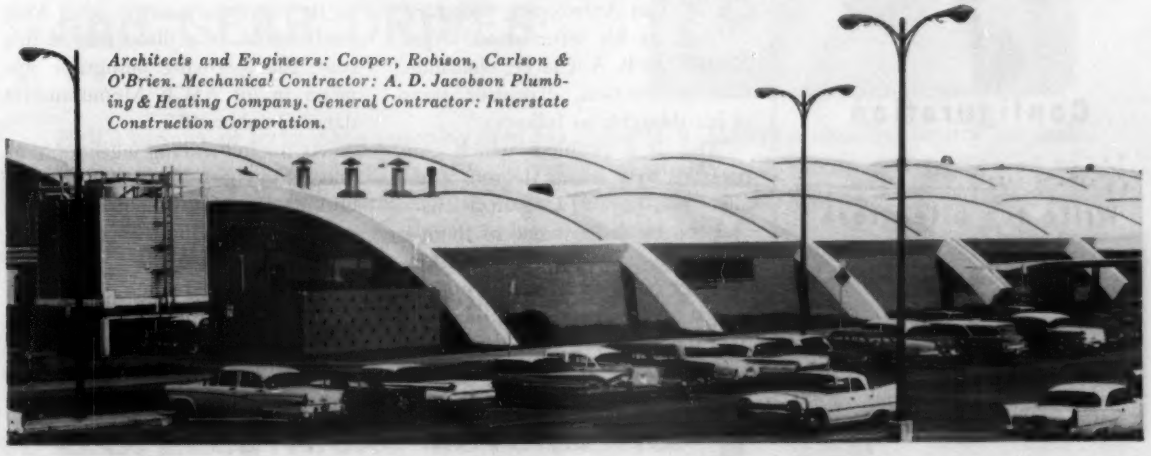

Architects and Engineers: Cooper, Robison, Carlson & O'Brien. Mechanical Contractor: A. D. Jacobson Plumbing & Heating Company. General Contractor: Interstate Construction Corporation.

lative activities by the Society, its local sections, and its affiliated organizations such as EJC or the Illinois Engineering Council, the proportion of our legislative activity to the over-all program of ASCE is extremely small. Our attorneys have confirmed the opinion that under no circumstances could our total legislative activities be considered 'substantial.'

"We feel that our legislative efforts and interests must always be directed toward the public interest. In fact, there is logic in the opinion that a society like ours is obligated to manifest opinions and to give advice to legislators in public affairs which involve engineering matters of great importance. This is one kind of public service through which an organization merits its tax exemption.

"In our legislative activities, we make it a point to endorse or to oppose principles rather than to take a stand on specific legislative bills. We also studiously avoid involvement in controversies involving individuals where there may be a political implication.

"The Illinois Engineering Council has proved itself as an effective medium for service to the public and to the engineering profession in the past. It is hoped that the ASCE local sections in Illinois will continue to support the Council and to participate actively in it. Acting with good judgment and discretion, IEC should be able to continue its good work without jeopardy to national . . . societies."

F. J. Van Antwerpen, secretary, AIChE, in his letter dated April 13, 1960 to R. A. Clarke, chairman, Chicago Section, expresses some of his thoughts as follows:

"This is a problem which concerns us to a minor degree. Actually, 501 (c)(3) organizations — and the Institute is one of them — may lobby provided that a substantial part of their income is not devoted to lobbying, and provided that the lobbying that they do is in the interest of the public, and not to obtain special privileges for their members. But even so, if they did lobby for special privileges for their membership, the problem of 'substantially' would enter, and I do not think that this would endanger the tax status of AIChE."

Octave DuTemple, executive secretary, American Nuclear Society, has expressed the opinion that he is in general agreement with the viewpoints quoted above. DuTemple also recommended for reference a book entitled *Federal Tax Aspects of Association Activities*, published by the U.S. Chamber of Commerce. In this book, pages 56 and 57, the following statements appear:

¶ "There is no requirement, by statute or regulation, that a trade association, in order to be considered exempt, refrain from carrying on propaganda or seeking to influence legislation. Such a limitation (as a substantial activity) is explicitly applicable by statute to a corporation or other organization operated for 'religious, charitable, or educational purposes' under section 501 (c)(3) of the 1954 Code."

¶ "The Internal Revenue Service will not disqualify an organization where the legislative activities are incidental."

In 1948 the Collector of Internal Revenue notified the American Society of Civil Engineers that its tax status had been reclassified from 501 (c)(3) to 501 (c)(6). These sections were known at that time as 101 (6) and 101 (7) respectively. The Society was finally returned to its previous position after long conferences. In a discussion of this case, the following paragraph appears in an ASCE Memorandum dated October 1953:

"As for influencing legislation, as alleged in court (3), ASCE did not hesitate to agree that it and Engineers Joint Council have testified before Congressional Committees on many matters which either have a bearing on the welfare of the profession or, regarding the engineering viewpoint, can be of con-

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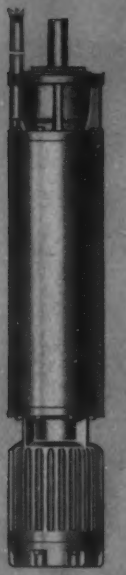

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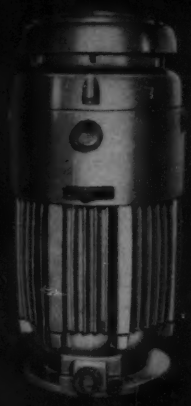

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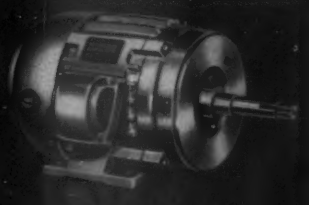

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structive value in formulating legislation of importance to the national welfare. The Society was able to show that the occasional appearances of its members generally were upon the invitation of Members of Congress because engineering questions were involved, and that substantially all of these activities were of nonpartisan, noncontroversial, and educational nature. Furthermore, no 'substantial part' of Society expenditures was made for such endeavors. We were able to show that in attempts to influence legislation we were not 'unduly active' . . ."

Paul W. Gordon, Jr., legal counsel to the Illinois Engineering Council, in his letter dated October 24, 1960, gives the following opinion and comments:

"In my opinion, the various member organizations making up the Illinois Engineering Council would probably qualify for exemption under 501 (c)(3). They would thus be exempt from taxation providing that no substantial part of their activities consisted of attempting to influence legislation. I think that it can be safely said that membership in IEC, both in terms of funds expended and participation in its activities, as compared to all of the funds expended and activities of the individual members, could not be considered substantial. I feel certain that membership in IEC would not disqualify any member society from exemption under Section 501 of the Internal Revenue Code of 1954.

"As for the Illinois Engineering Council itself, I am inclined to think that it would more properly qualify for exemption under 501 (c)(6). You will note that there is no limitation under this subsection with respect to the degree of legislative activity that organizations qualifying under it may engage in."

Future Activities

The Illinois Engineering Council has been and intends to continue to be active in legislative matters. However, it is the opinion of the present officers and executive committee, and their legal counsel, that the legislative activities in which the Council participates are altogether too small to constitute a "substantial part" of the activities of any one of its individual and autonomous member societies. Certainly, the annual dues of the members societies to the Council do not represent a "substantial part" of the member societies' expenditures. Furthermore, legislative efforts and interest have been directed toward the public interest in the past, and this policy will continue in the future. The executive committee believes that the legislative and other activities of the Illinois Engineering Council do not jeopardize the tax status of either the member societies in the State of Illinois or the national organizations to which they belong. ▲▲

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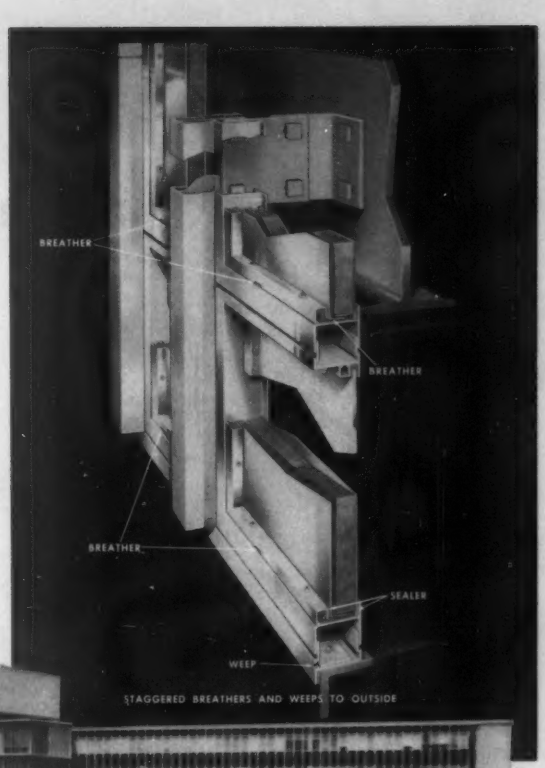

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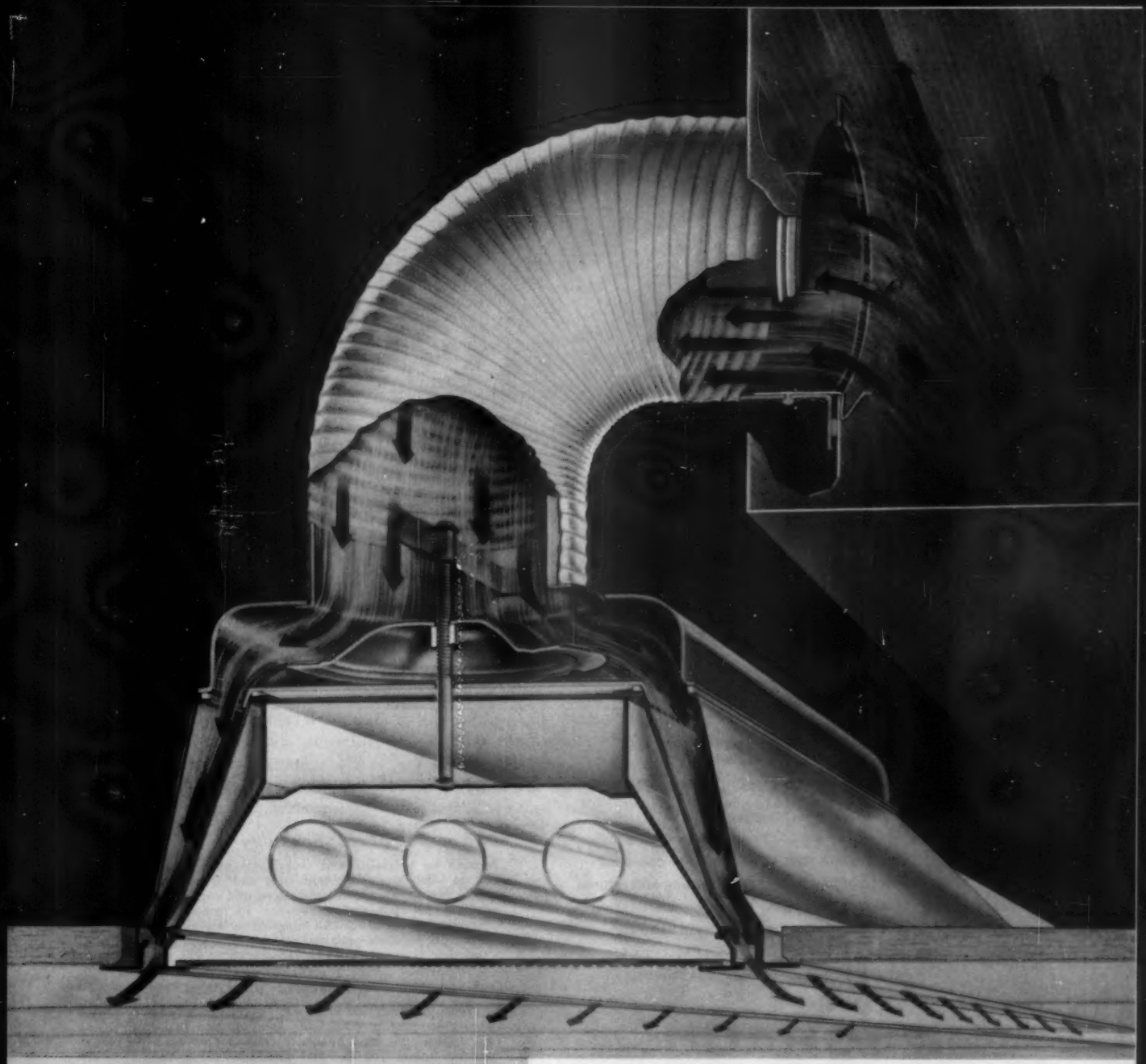

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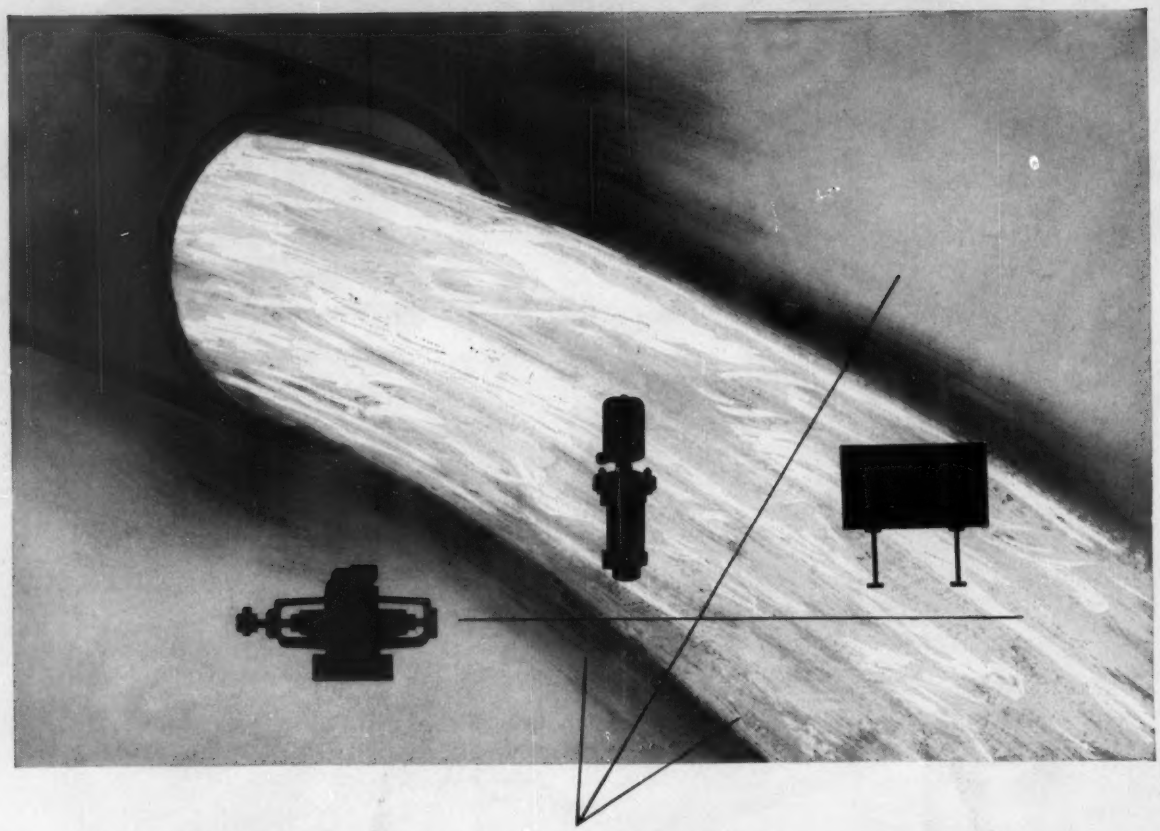

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Rulings on Mechanic's Liens

THE CASE of *Janoviak v. Butcher* (159 N.E. 2d 377), decided June 24, 1959, was an action brought by a contractor to foreclose his mechanic's lien against the owner.

The plaintiff had entered into seven separate written contracts with the defendant owner, for the construction of seven prefabricated houses. Each contract contained a provision that the owner would pay 60 percent of the contract price when the house was delivered and erected on the concrete slab. The balance was to be paid on final inspection and approval by the lender, who made construction loans for the erection of the houses. The contracts also provided that the contractor waived his rights, under the Mechanic's Lien Act, to a mechanic's lien for labor and materials. He also agreed that no claim of lien would be filed by him.

After several houses had been erected, disputes arose; owner made no further payments, and plaintiff stopped work and brought suit to foreclose his mechanic's lien.

The issues were (1) whether it is legally possible to waive the right to a mechanic's lien; and (2) whether such a waiver would be effective despite subsequent breach of the contract by the owner.

The court held that there is nothing in the law to prevent such a waiver, and that it is not nullified by a subsequent breach of contract by the owner. The reasoning given was that a mechanic's lien is never effective until there has been a breach of contract, and if that breach is to cause a nullification of the waiver, the waiver would have no meaning at all.

These holdings are in accord with the weight of authority as developed in other states. (See 76 A.L.R. 2d 1087.) It should be kept in mind, however, that waiver of the mechanic's lien is not a waiver of the right of the contractor to sue the owner personally for money damages.

It has been held in some cases that a subcontractor is not bound by a provision against liens in the contract between the owner and the contractor, unless there is affirmative evidence of his assent to be bound. However, in some states it has been held that where a subcontractor has actual knowledge of such a provision against liens in the contract between the owner and the contractor, the subcontractor is bound by it. Furthermore, in a few states (Ill., Md., and Pa.,), there is a statute providing that recording of a "no lien" contract constitutes constructive notice to subcontractors, preventing them from enforcing mechanics' liens for

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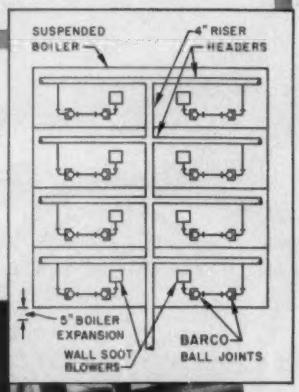
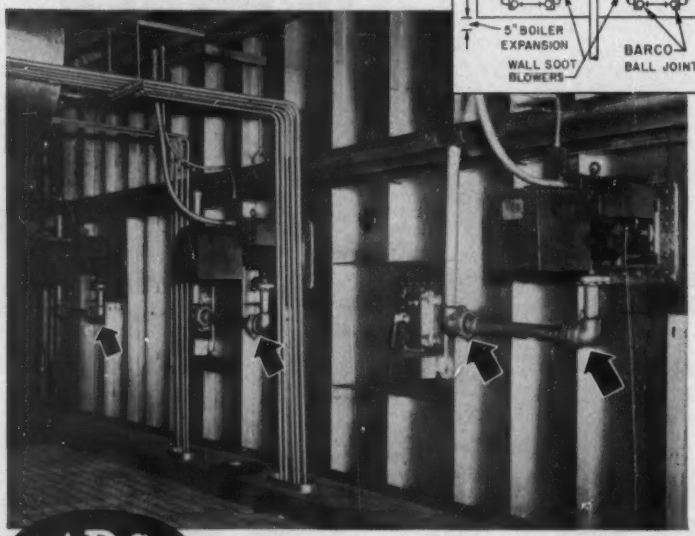
(See diagram and photo) This suspended steam generator moves downward 5" or more between "cold" and "hot" positions. Barco Ball Joints on lines to the soot blowers easily allow movement and eliminate twisting stresses. Service: 300 psi air, ambient temperature (also suitable for steam). Three years experience with 62 joints installed here shows no maintenance required.

(*Photo: Pennsylvania Power Co., New Castle, Pa. Consulting Engineer: Commonwealth Associates Inc., Jackson, Mich.*)





BARCO **BALL JOINTS**

SAVE PIPE – 30° FLEX!

Many Barco Ball Joints are now going into soot blower piping connections. Here's why:

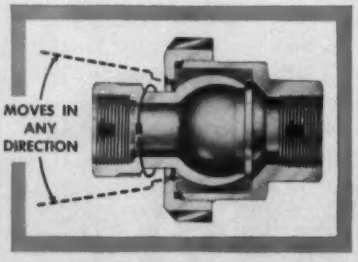
MORE FLEX! SHORTER PIPE! Instead of allowing only ½" flex per foot of pipe, Barco provides up to 6".

PRESSURE-SAFE—No danger of blow-outs. Joints contain no material that gets "tired" or deteriorates. Safe for alternate use with high temperature steam.

SAVE TIME—Piping design simplified. Easy to solve complex pipe movement problems with minimum engineering time.

NO MAINTENANCE NUISANCE—Joints work without attention or inspection. No lubrication. No periodic replacement. Always "self-aligning".

Besides use on Soot Blowers, Barco Ball Joints in power plants are now finding application on steam exhaust relief lines, feedwater connections, acid cleaning lines, gas lines, pump connections, and expansion loops. They provide many advantages: FIRE-SAFE and virtually indestructible; easy to engineer — develop no "end thrust", don't require anchoring. Sizes and styles for every purpose; threaded, flanged, or welding ends. *Ask for complete information.* SEND FOR CATALOG 250.



BARCO MANUFACTURING CO.

5721 Hough St., Barrington, Illinois
In Canada: The Holden Co., Ltd., Montreal

labor or materials supplied after recording of the contract.

Filing Notice of Lien

Normally, mechanic's lien statutes require the filing of a claim of lien within a certain time in order to preserve the lien – e.g., 60 days after completion of the building or improvement, after the time materials were furnished, or after the debt becomes due. Also the lienor normally must serve notice of his lien on the owner.

In Hadrup v. Sale (111 S.E. 2d 405), a Virginia case decided November 30, 1959, suit was brought to enforce a mechanic's lien on defendant's house and lot, for plumbing and heating work on the building. The claim of lien had been filed on July 29, 1957. However, on March 19, 1957, defendants had purchased the lot from the prior owner, a development corporation. The deed had been recorded, but plaintiffs had no actual knowledge of the sale until the day they filed claim of lien.

The work on the building was completed during the second week of August, 1957. The statute allowed 60 days for filing, "from the time such building . . . is completed, or the work thereon otherwise terminated." The legal issue raised was whether the sale automatically caused the work to be "otherwise terminated" within the meaning of the statute.

The court held that, in legal contemplation, a sale does not automatically "terminate" the work, and that the mechanic's lien was valid, having been filed even before the work on the building was completed. The purchaser of the property does not take free of the lien, even though it is not filed until after his purchase. He must inquire what contracts are in course of execution on a property which he is about to buy, and what possibilities of liens may exist.

This holding is in accord with similar cases from other jurisdictions. (See 76 A.L.R. 2d 1163). ▲▲

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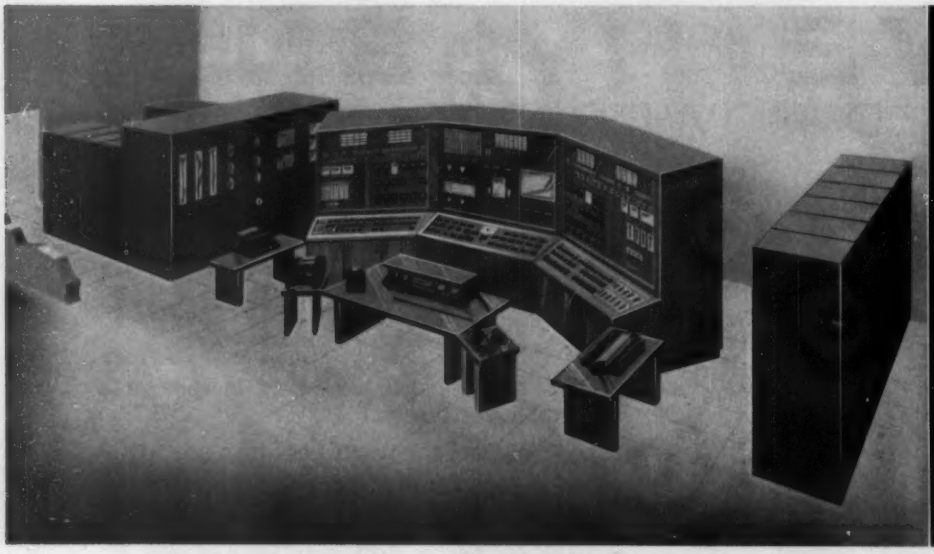
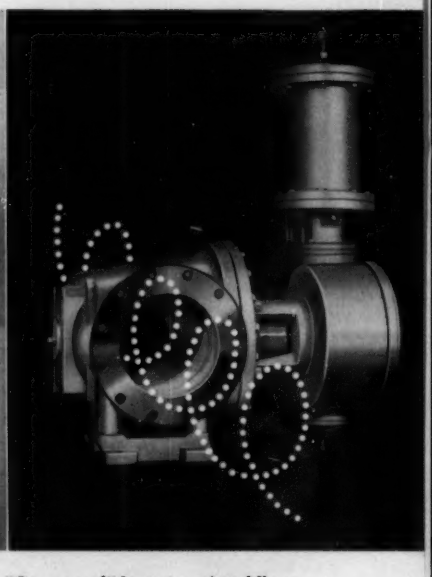
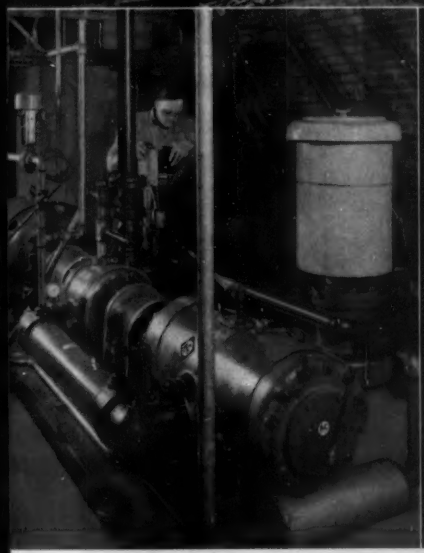


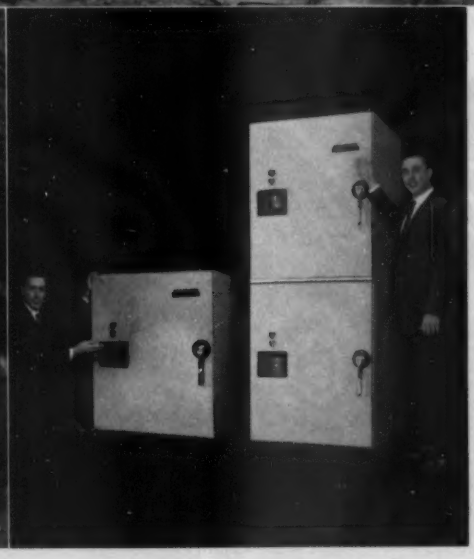
For quality control . . . lower power costs: With the acquisition of Consolidated Systems Corporation last year, Allis-Chalmers extended its ability in the areas of data gathering, handling and utilization. CSC provides such experience acquired from more than 500 successful system projects. Recently, Allis-Chalmers, Consolidated Systems and International Business Machines Corporation effected a nonexclusive mutual agreement relating to the production and marketing of automated control systems.

For the typical system, A-C takes functional responsibility for the system using IBM data processing computer equipment, CSC specially engineered data conditioning equipment, instrumentation, and A-C power and industrial processing equipment. Now, Allis-Chalmers brings balance of specialized judgments to bear on your problems . . . drawn on significant experience . . . to make major "contributions to the art" in many phases of *Systemation* and help you be sure before you invest.



"Open road" for unrestricted flow: This *Rotovalve*, when wide open, offers no greater resistance to flow than a straight pipe of equivalent length. Promotes lower pumping costs. Actually seats itself tighter with use. And special shutoff characteristics reduce water hammer. All moving parts are totally enclosed, yet easily accessible.





Transformers "grow up" but don't get bigger: New Allis-Chalmers transformers deliver as much as a 30% increase in kva without any increase in size or weight. This permits replacement of old transformers without altering base mountings or overhead structures. This unit being installed has twice the rating of the neighboring 3500-kva transformer.

More air . . . less wear, with vibration-free compressors: *Ro-Flo* compressors with sliding-vane rotary design eliminate operating losses inherent in reciprocating machines. Centrifugal force keeps vanes in close contact with cylinder walls, automatically compensating for wear. In addition, fewer moving parts result in less wear, reduced maintenance costs.

So low, two fit where one used to go: This new *SpaceMaker* control center is the first completely new 2- to 5-kv motor controller development in more than a decade. New, compact two-high design can cut floor space requirements in half. Complete drawout construction makes it the safest, most easily accessible controller on the market. New flame-retardent, track-resistant Super *Pyro-Shield* insulation adds to reliability, reduces size and weight.

A-1525

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ALLIS-CHALMERS

The High Spots

Shoddy Construction?

Maurice Barron, of the New York engineering firm of Farkas & Barron, has answered a recent article in *Harper's* magazine, which charged that shoddy construction is one of the results of current real estate speculation. Barron points out that "certainly there is some shoddy construction," but there is no more now than there was at any other time, and it is no excuse for "a sweeping indictment of the real estate and construction fields.

The *Harper's* article, "The Coming Bust in the Real Estate Boom," dealt primarily with the evils of real estate speculation, and charged that poor design, inferior materials, and improper construction techniques were the result.

Package Plant Opportunities

According to the *Foreign Commerce Weekly*, published by the U.S. Department of Commerce, unlimited opportunity awaits the American businessman who can put package plants into operation in foreign countries. These foreign countries, particularly the semi-developed ones, are anxious for what *FCW* calls "instant industry."

Contest Results

The Onan Division of Studebaker-Packard Corporation, a leading manufacturer of electric generating plants, recently ran a contest in the pages of CONSULTING ENGINEER, offering 1000-watt portable generating plants as prizes to the persons who submitted the best practical applications for these plants. The company has selected what it considers the 10 best new ideas for the use of the plants, and has announced the names of the winners – they range from a priest in Puerto Rico to a power commission

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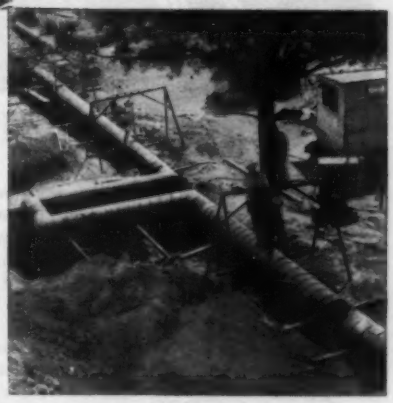
Test caps applied to unit ends for air testing full-welded conduit system.

During air test, conduit field welds are checked with soap solution.

Tested and ready for lowering long lengths.



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YOU can AIR TEST your system...

The Ric-wiL method of making full-welded field closures allows the installer to AIR TEST the system prior to completion and backfilling. This simple 15 lb. pressure test gives greater assurance of a tight, leak-proof system. It provides the finest practicable protection to the owner against an initial system failure ...and most important, the long range effects of water corrosion.

Ask a Ric-wiL field representative for detailed information regarding Air Test procedure or write for catalog covering recommended field installation details . . . and remember, it pays to do it RIGHT the first time . . .

Quality Piping Systems . . .
. . . of Exceptionally High Thermal Efficiency

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engineer in Ontario. However, the company has not announced the winning ideas. Apparently they were so good that the Onan people are afraid their competitors will try them.

Advanced Study

The College of Engineering of the University of California at Los Angeles has announced a new series of graduate fellowships, on both pre- and post-doctoral levels. The basic objective of the program is to provide a substantial core of persons with advanced degrees, capable of expanding the field of engineering education.

The fellowships will permit graduate students to pursue – or continue – their education and research, with a minimum of outside requirements. It is hoped that the program will help direct the undergraduate engineering curriculum, with the objective of providing, for every engineering student, a thorough grounding in all sciences basic to engineering, a systematic study of design, an awareness of the social implications of engineering, and an orientation toward continued growth in his field.

Water Heater Seminars

Over 700 consultants, architects, and building code officials attended a series of seminars conducted by the Southern Heater Company in six Southern states. The seminars were jointly sponsored by SHC, the Ruud Manufacturing Company, and the Construction Specifications Institute.

In 18 of the largest cities in the South, the importance of national, state, and local codes was discussed with relation to the changing design in commercial gas water heaters. Speakers at the seminars agreed that stricter codes by ASME, the American Gas Association, and the National Sanitation Foundation have led to important design changes, and a general upgrading of the heater industry.

Consultant Cary Gamble (right), with H. N. Stall, at water heater seminar.

Utility Financing

According to a survey made by Ebasco Services, Incorporated, financing by the nation's privately owned public utilities increased by 77 percent in the first half of 1961. The total for the first six months was just under $3 billion, a gain of more than $1.3 billion over the corresponding period of 1960.

The biggest gain was noted in telephone financing, up 333 percent to $1.5 billion. Gas utility financing increased to $590 million, while

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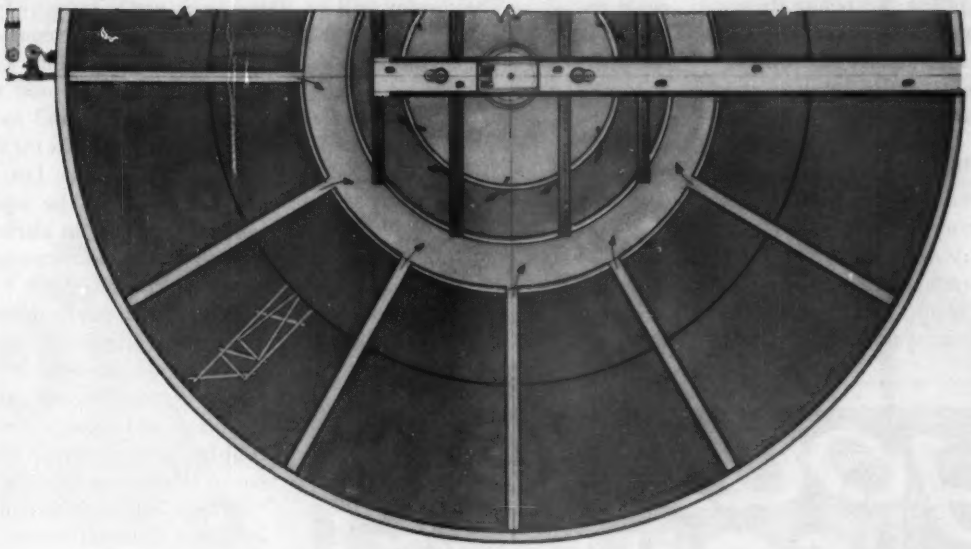

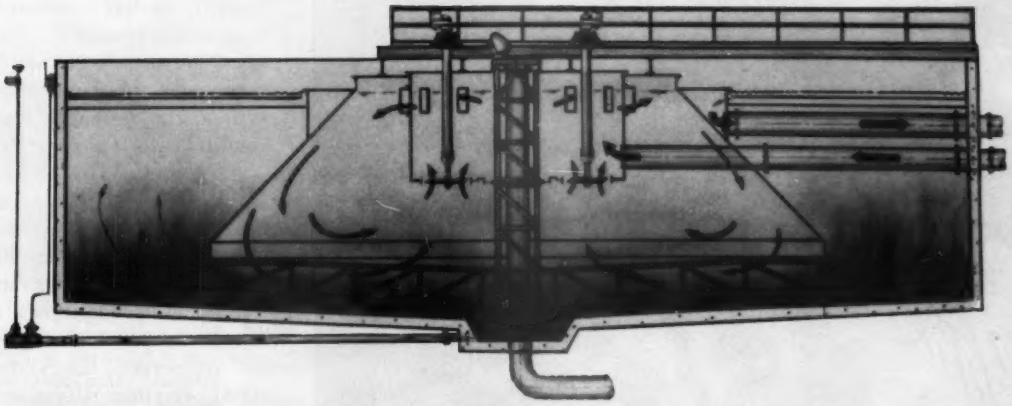

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Clariflow Inlet for flow-thru control. The tried and proven Clariflow Inlet controls density currents and eliminates flowing-thru short-circuiting.

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electric utility financing dropped slightly to $813 million. The study showed that almost $2.5 billion — 84 percent of the total — represented new financing.

Architectural Library

The Preco Chemical Corporation, of Westbury, New York, has started a "Library of World Architecture." The library will include photographs, plans, and renderings of outstanding commercial and private buildings. The display will be open for study to persons in the design professions, builders, students, and, we are told, editors. Company officials hope to expand the program at a later date to include an annual national design competition.

Dowsing Computers

Analog computers have been used by the California Department of Water Resources to help replenish the fresh water supply of Los Angeles County. The computers, at the EAI Computations Center in Los Angeles, were used to determine the number and location of water injection points for the water storage basin under Los Angeles.

Water level in the aquifer has been dropping at an alarming rate, due to the rapid increase in demand in the Southern California region. In addition to the imminent shortage of water, officials discovered that the lowered water table level was allowing salt water from the ocean and sewage run-off from near-by areas to contaminate the basin. Water was brought in from Northern California to build up the level, but the information from the computers was necessary to find out where the water should be piped into the ground. According to the engineers who ran the computer calculations, the studies saved thousands of man hours of time, and permitted a careful analysis of the probable water level conditions for the next 100 years.

Moonlighting

The State Highway Commission of South Dakota has established a strict policy governing outside activities of its employees. In addition to the usual "conflict of interest" restrictions, the South Dakota ruling requires Commission employees to submit complete information on outside work, and to receive permission from their department heads to do the work. Commission spokesmen said the policy was not directed at any suspected or actual violators; it was merely a statement of "commonly understood principles that have guided nearly all highway employees over the years."

Highway Directory

The American Road Builders' Association has announced publication of a new edition of *Highway Officials and Engineers*, a directory of the key administrative engineers and officials throughout the coun-

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C. E. Caveness, North American Aviation Electrical Engineer, and Robert H. Waddell of Smoot-Holman inspect completed installation of Perfect Vision® Luminaires in the Advanced Engineering Office of North American's Space and Information Systems Division, Downey, California.

WHY NORTH AMERICAN CHOSE "PVs"

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try. The directory gives names and addresses of officials of state highway departments, the Bureau of Public Roads, and toll road authorities. It is available for $1.00 from ARBA, World Center Building, Washington 6, D. C.

Highways and Economics

A new bulletin from the Highway Research Board contains a series of papers on the economic impact of new highways and thru-ways. Several authors, working independently, concluded that, contrary to popular assumptions, a super-highway may produce higher values for a community than the construction destroys. Specific findings include:

¶ By carrying through traffic away from the business section of a community, a by-pass actually may help local business, freeing streets for the local shoppers.

¶ A few roadside enterprises are adversely affected by new by-passes, but most businesses in a community are not upset.

¶ The typical industrial firm does not realize the total economic impact of modern highways on business operations.

¶ Urban expressways have a measurable effect on distribution of population and the nature of land use. A new highway through an area will set off a series of changes in land use, and its full effect may not be felt until as much as eight years after the opening of the road.

Several of the authors felt that highway organizations have not given proper consideration to this impact of highways in urban areas. Professor Edgar M. Horwood, University of Washington, declared that suburbanites, living outside the jurisdictions of the central cities in which they work, are not bearing their share of responsibility for meeting transportation needs. The average resident of an incorporated suburb "surrounds himself in his state-franchised municipal isolationism, and will not even admit of a remote concern with the nearby towns to which he sends his children to school, his wife to shop, or himself to work."

Two other authors, A. S. Lang and Martin Wohl, both of the Massachusetts Institute of Technology, felt that highway improvements do not produce any net economic benefits over and above user benefits (such as reduced transportation costs, time-savings, and reduction of accidents); and the so-called nonuser benefits (such as increases in land values, increased industrial investment, and expansion of retail trade areas) are of secondary status. Of considerably more importance than economic considerations in the planning of future highways, they maintained, should be the social impact of highways. The complete report is contained in Bulletin 268, which may be obtained from the Highway Research Board, 2101 Constitution Ave., Washington 25, D. C., for $2.60 a copy. ▲▲

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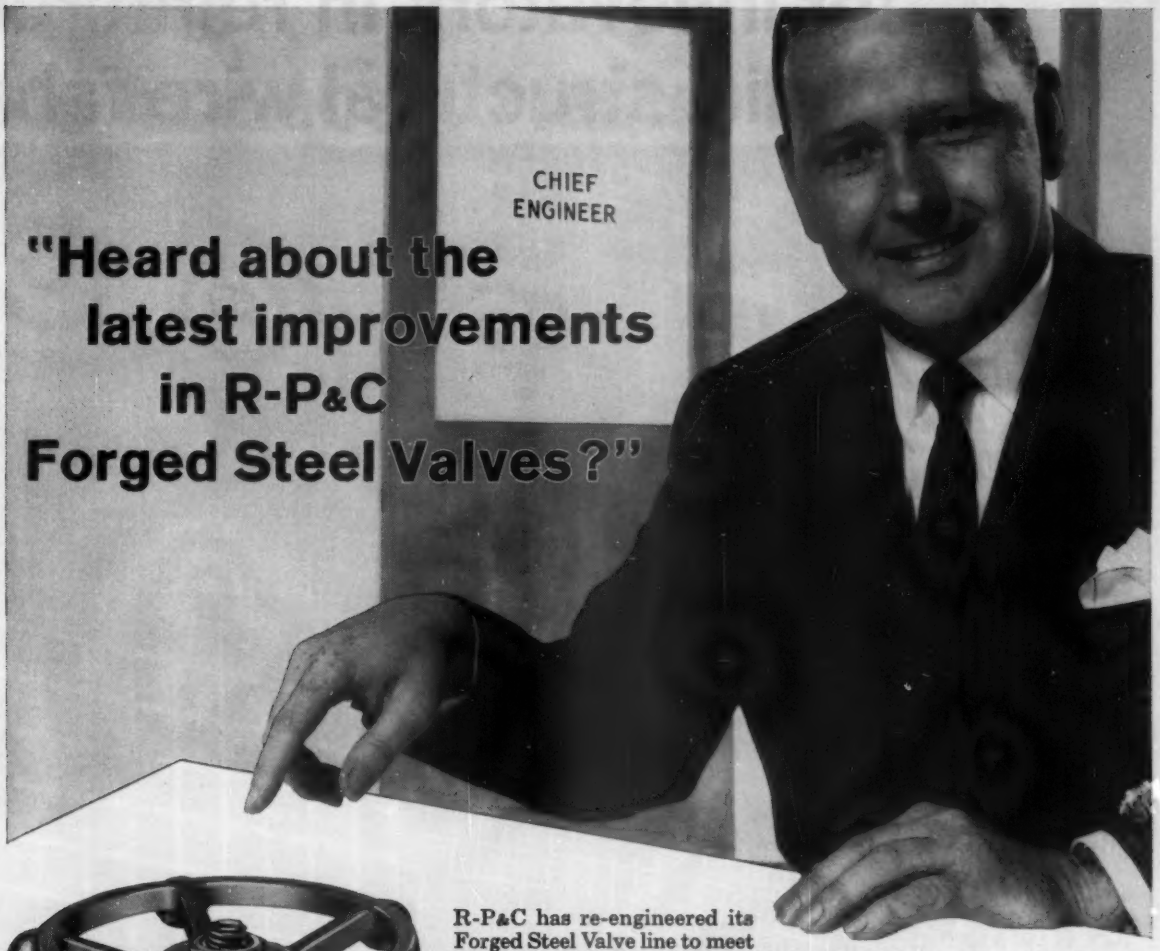
Copies of Bulletin 261A, "Who's Who in Certified Performance Ratings" are available from: Air Moving and Conditioning Association, Inc., 2159 Guardian Building, Detroit 26, Michigan.



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R-P&C has re-engineered its Forged Steel Valve line to meet the highest standards of quality for the Refinery, Chemical, Power and Process industries. These valves incorporate the most up-to-date design and material improvements found in any forged steel valve! One example is the stuffing box—redesigned for 50% greater sealing efficiency. These improvements add up to longer, trouble-free valve service for you, with minimum maintenance.

Here are other R-P&C Forged Steel Valve improvements:

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- **"390 Brinell" stem with rolled threads for continuously smooth movement**
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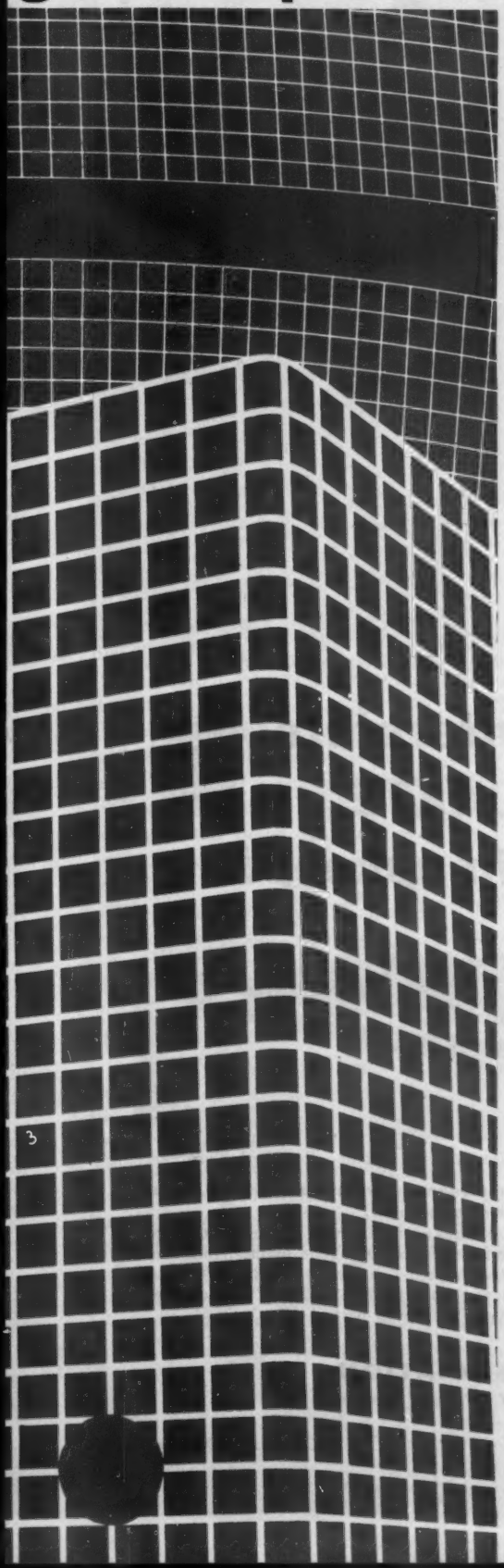
concrete...
goes in place 1/3 faster than bars



New Structural Wire Fabric will speed up and improve multistory building construction. Just consider these advantages: ■ Structural Wire Fabric mats go in place at least ⅓ faster. ■ Structural Wire Fabric eliminates thousands of time-consuming spacing and tying operations. ■ Structural Wire Fabric mats are prefabricated to your exact specifications of size and design requirements. ■ Structural Wire Fabric mats are "stiffer," your assurance that the steel will remain in the proper position in the concrete slab. ■ Structural Wire Fabric is made from high-tensile, high-yield cold drawn wire up to ½" diameter, permitting increased working stresses with a greater factor of safety. ■ Structural Wire Fabric is electrically welded at all intersections, assuring positive mechanical anchorage in the concrete. ■ For designs that call for innovations in concrete, look into Structural Wire Fabric. We'll be glad to assist you or your structural consultant with technical recommendations. Just contact our nearest sales office or write American Steel and Wire, Dept. 1250, Rockefeller Building, Cleveland 13, Ohio. **Innovators in wire.**

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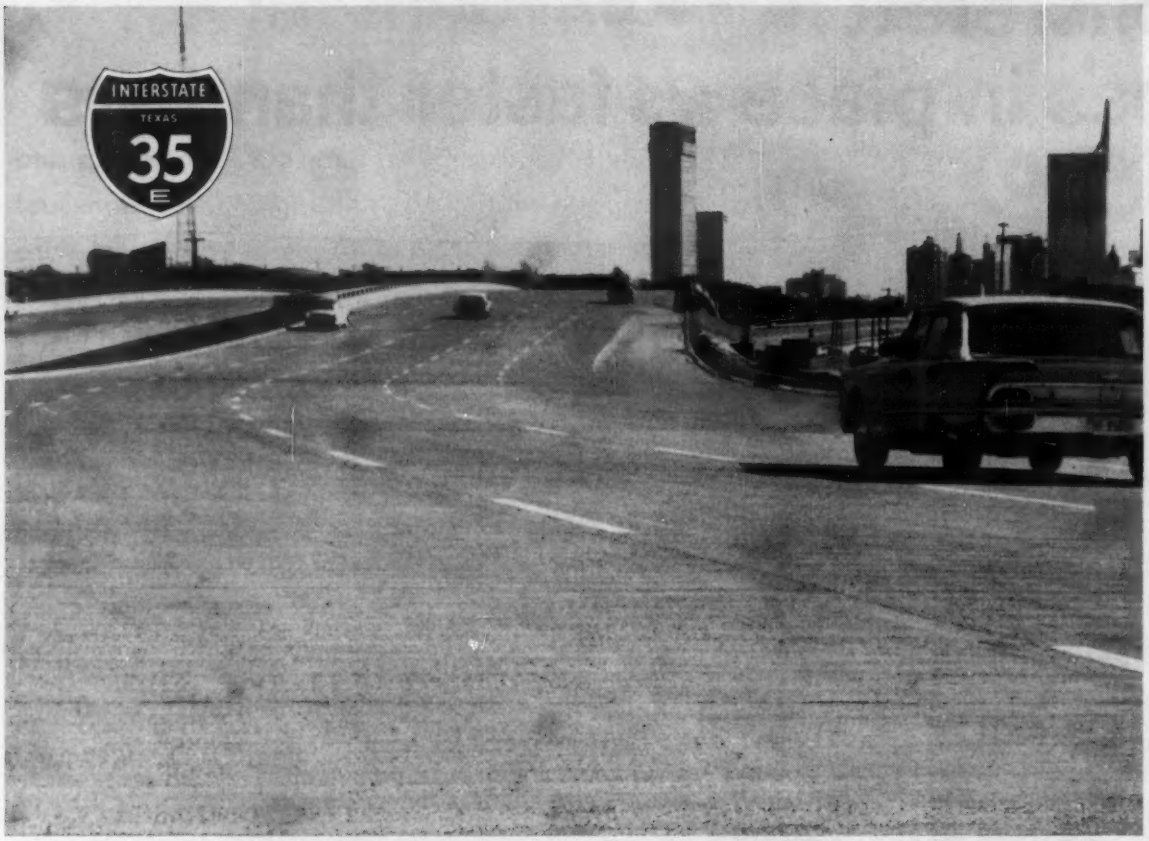


Texas Interstate 35E, Stemmons Freeway out of Dallas.

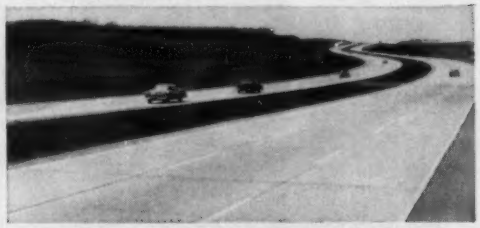
Texas' 352 miles of Interstate awarded to CONCRETE promise big savings in upkeep!

Across Texas, modern concrete highways grow in length—a public reminder of the skills and dedication of the engineers and builders who are creating them.

A solid future is built right into roads like these. Only concrete enables engineers to design pavements to last 50 years and more.

Concrete isn't flexible, so there are no "moving parts" in it to cause hidden wear. And even with the highest temperatures, it won't soften and ripple under traffic. Concrete actually grows stronger year by year.

All these advantages mean extra thrift for Texas as it builds with concrete: Exceptional pavement life . . . upkeep costs that run far less than for asphalt. It's for reasons like these that most Interstate mileage across the nation today is going to concrete.



Texas Interstate 20, Dallas—Ft. Worth Turnpike.

38% maintenance saving with concrete, Texas' 31-year records show!

Official Texas State Highway Department records give the facts: Since 1929, road maintenance costs per mile per year for concrete have averaged $144.68; for asphalt, $235.23. Texas' new concrete highways will do even better!

PORTLAND CEMENT ASSOCIATION

A national organization to improve and extend the uses of concrete

"Quote . . . End Quote"

Engineers' Report on Baseballs

"Baseball fans, who are swiveling their heads like spectators at a tennis match as home-run balls fly by, are asking:

'Is the 1961 ball the same ball that Babe Ruth hit?'

"Scientific tests show that maybe it is, and maybe it isn't . . .

"*The New York Times* decided to subject some baseballs — a total of seven, including a vintage ball of 1927, a 1936 ball, and one from the current batch being launched at Yankee Stadium — to scientific analysis.

"The tests, made by technicians who had no rooting interest in the outcome, were undertaken by Foster D. Snell, Inc., consulting chemists and engineers, at 29 West Fifteenth Street.

"After subjecting two of the balls to surgical dissection; and all of them to battering by an explosive-driven Remington Arms Ram, to deformation measurements with a vernier caliper, to study by a rubber technologist, and to similar probings, the technologists do not find anything in any of the balls to show clearly that a home run has been easier to hit in any one period of baseball than in any other . . .

"The two technicians who conducted the experiments, Robert W. Batey, the company's director of special evaluations, and Stephen E. Taub, . . . acting director of engineering, reached this conclusion:

'The 1961 ball is slightly larger, slightly lighter, and slightly livelier than one 1927 ball.'"

"(The 1961 ball studied by the experts was donated by the New York Yankees and the 1927 ball was a treasure piece that Babe Ruth smacked for a homer at the Stadium.)" — *The New York Times*, August 14, 1961.

We Plead Guilty

"Does '$1.9 billion' look like as much money to you as '$1,900,000,000?' A good many people don't think so; some suspect that the new way of indicating large sums is a scheme by the big spenders to make billions look like chicken feed.

"Where did this mixed-up, cockeyed way of writing large amounts of money come from? The chairman of the Government Printing Office style board in Washington, which makes the rules about what is right and wrong in the printing of public documents, says that when Federal spending got into

FLUIDICS
SPOKEN HERE
Water treatment news for the consulting engineer

New Underdrain Design

"Unimedia" System For Gravity Filters Or Softeners Uses No Subfill

By J. S. Kneale, Manager, Cold Process Section, The Permutit Company

ENGINEERS who design concrete gravity filters and softeners can now rule out subfill as a cost and operating factor. A newly developed underdrain system, the Permutit "Unimedia" does exactly this by eliminating subfill entirely. The "Unimedia" Underdrain incorporates only the filter medium or ion exchanger. Advantages are many, ranging from reduced construction cost and the removal of gravel handling and storage requirements to excluding any possibility of upset beds when the unit is backwashed.

How It Works: Key component in the design is a unique non-clogging plastic disc-type strainer which has been used in Permutit Pressure Filters, Softeners and Demineralizers for several years. Strainer stacks, mounted on 12 inch centers, directly retain the actual filter medium. No subfill is needed. All strainer heads are on one level, assuring uniform collection of filtered water and distribution of wash water.

Two Types: Available for both header-lateral and false-bottom designs, the "Unimedia" underdrain system is non-corrodible throughout. Materials are plastic, asbestos, cement and concrete.

Pre-Assembled Components: All components are assembled at the Permutit factory including pre-cut laterals, manifold covers, false-bottom sections, extension stems and strainer assemblies.

Low Cost Installation: Pre-assembled components speed installation, reduce construction costs. Header-lateral design permits casting laterals in the true filter bottom, thus eliminating a second concrete pour, as well as anchor bolts, complex reinforcing and form work.

False-bottom construction is equally simple. "Unimedia" sections are placed directly on the true bottom piers. Joints are sealed, reinforcing placed and final concrete poured.

In both types, nothing projects above top surface; screeding the final pour is easy. After the final surface is set the strainer heads are placed and the installation is complete.

If you want more information ask for bulletin 4831 on the Permutit "Unimedia" Underdrain System. Write to Dept. CE-101, Permutit Division, 50 West 44th Street, New York 36, N.Y. (In Canada: Permutit Company of Canada, Toronto.)

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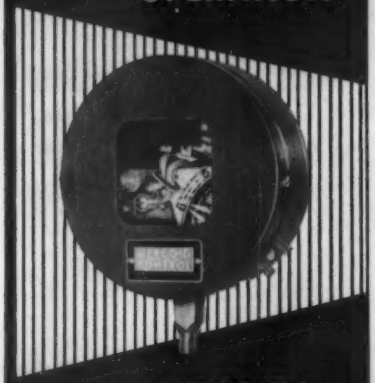

1 MERCOID® PRESSURE CONTROL

MERCOID DA-400 SERIES

Pressure Controls are dual purpose controls, incorporating a single pressure element operating two separate, independently adjustable Mercoid magnetic switches. The switches may be used for multiple circuit control for various operations as the control responds to pressure changes.

For example:

- Close one alarm circuit at high pressure and another at low pressure with both circuits open over operating range.
- As an electrical interlock to open one circuit as pressure rises above and the second circuit as the pressure drops below operating range.
- To provide two-stage control by opening or closing one circuit on a rise in pressure and the second circuit on a further rise in pressure.

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WRITE FOR BULLETIN NO. 11

THE MERCOID CORPORATION
4201 Belmont Ave., Chicago 41, Ill.

the billion-dollar class, printers repeatedly ran out of ciphers and had to spell out 'billion.' He says further that the use of the dollar mark in front of the small figures instead of spelling out 'dollars' after the word 'billion' was a 'typographical short cut' and an aid to the reader's comprehension of large amounts . . .

"Today this system seems to be an accepted way – almost the exclusive way – of representing large amounts of money. Some writers appear to abhor completing the writing of any sum of money with figures exclusively. It would be a joy to be able once again to read '$1.99' as 'one dollar and ninety-nine cents' without having to look behind for that 'billions.'" – *Saturday Evening Post*, August 19, 1961.

A Technological Peace Corps

"Several recent examples have indicated the inadequacy of our intelligence concerning other countries. A far more technological approach must be taken. This involves collecting much more information concerning the activities of potential enemies. There is nothing immoral or dishonorable in becoming completely informed about one who says 'we will bury you.' The continuous, intensive, widespread scientific collection of such information must become a national policy. Every conceivable type of electronic and human picket must be used, including spy satellites; unmanned probes; and earthbound, undersea, and various manned peripheral probes. A major expansion of the world's communications networks is necessary so that rapid facsimile, pictorial, tabular, and other data can be communicated. Information collected by people and machines must be catalogued, stored, retrieved, and analyzed using the latest computer and machine techniques. Detailed information is also necessary to measure the effectiveness of our overseas assistance programs. The establishment of a professional, technological peace corps is proposed. This activity may also attract those competent persons having religious objections to fashioning weapons of war. Such a 'peace corps' can be afforded by curtailing expensive and obsolete programs now under way." – Summary of a talk by C. D. W. Thornton, presented to the *Institute of Nuclear Materials Management*, June 12, 1961.

Ground Rules for Government

"The struggle for the preservation of free enterprise imposes great burdens upon the government also. Governmental agencies charged with enforcement of the antitrust laws and the proscription of unfair trade practices must exploit every resource available to them to insure that competition is free and fair. The malefactor must be restrained with swiftness and certainty, in order to deter others who may be tempted. And every businessman willing to accept the responsibilities that freedom brings must be educated in the letter and the spirit of the ground rules of competition, so that no one may transgress through ignorance.

"But government proscription or regulation of economic activity must be limited, in the main, to the promulgation and enforcement of the 'ground rules' under which fair and vigorous competition may take place, and to the penalization of those who wax strong through unfair methods. The government in its regulatory role fails if the monopolist or the predator imperils the freedom of the market place; it also fails if an iota of the freedom of individuals is sacrificed unnecessarily in the effort to contain the monopolist or fence in the predator.

"Woodrow Wilson wrote, 'Human nature is much the same in government as in the dry-goods trade. Power and strict accountability for its use are the essential constituents of good government.' The prescription can be completed by stating its obverse: Human nature

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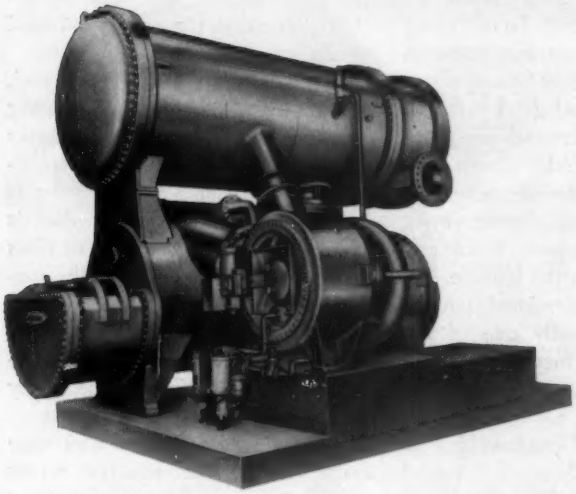
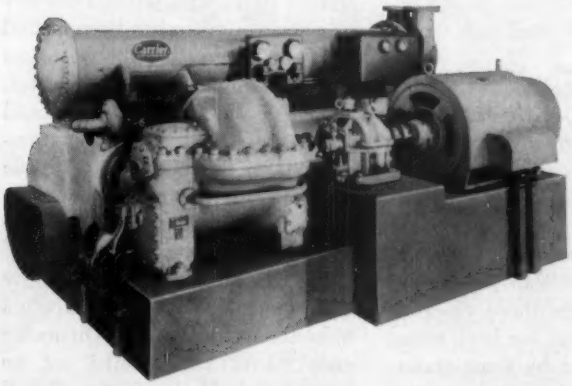
... electric motor, steam or gas turbine, diesel or gas engine!



Carrier Centrifugal—2000 to 5000 tons

With barrel type compressor—can be used with electric motor, steam or gas turbine, diesel or gas engine drives.



Carrier Centrifugal—100 to 2000 tons

With horizontal split casing—can be used with electric motor, steam or gas turbine, diesel or gas engine drives.

The versatility of Carrier Centrifugal Refrigeration Machines is practically unlimited for air conditioning, process cooling or low-temperature refrigeration down to minus 185 F.

They are available in the industry's widest range of capacities—from 100 to 5000 tons.

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is much the same in business as in government. Exercise of power by the individual and strict accountability for its use are the essential constituents of free enterprise." — "How Much Control Can Business Endure?", by Earl W. Kintner, in the *Journal of Marketing*, Volume 25, No. 5, July 1961.

The Realities of Recruitment

"There are those who have called for an end to all recruitment at all technical meetings. We do not feel that this is facing facts. Daily changes in defense requirements of necessity affect manpower needs. The national good makes it imperative that critical programs be properly staffed. Where new jobs cannot be filled from within, and there is no time to train young men, the only recourse is for employers to look on the outside.

"Important professional gatherings are traditionally one of the best ways for engineers and scientists to assess new developments and new projects, not only as they relate to technical progress, but as they relate to each man's personal professional development as well. There is no more logical place to do this than the yearly gathering of the clan in convention." — "Some Thoughts on Technical Recruiting," by William A. Douglass, president of Careers Incorporated.

Forgotten Man: The Motorist

"That the 41,000-mile Interstate System will be a great contribution to the national economy and defense cannot be denied. Nor can it be gainsaid that it is opening new vistas and new travel savings to the motoring American public.

"But it becomes more obvious each week that there has been more than the oversight by some states as to the maintenance costs they face in the future.

"Discomfort and confusion are faced by the long-distance motorist because no provision has been made to meet such human needs as food enroute . . . telephone communication facilities, [and] gasoline for his car.

"True, there are signs at the infrequent access-egress points announcing that fuel, food, or lodging is available at some place on a feeder road off the interstate highway. Contrast this with the properly spaced service areas of the major toll roads, which provide all the necessities for the comfort of the traveler and the fueling of his car. Proper use of deceleration and acceleration lanes prevents any interference with the normal toll road traffic patterns.

"Experience shows that fuel, food, communications, and lodging facilities often are not immediately off the interstate route; that sometimes a drive of a mile or miles is necessary. In some cases what is available is not adequate, or does not meet the standards of the motorist. This adds up to time lost and leads to irritabilities which can turn the safe driver into a dangerous one, thus defeating the safety built into the $41-billion system.

"A review by Federal and state authorities of this situation seems mandatory." — from *Views of a Consulting Engineer*, published by Lawrence S. Waterbury.

Atomic Waste Disposal

"Put in its starkest terms, Professor Eliassen's problem has been to find a way safely to store the wastes so that earthquakes, attacks of water, and other natural processes would not release them to the environment, even though the responsible governments which first buried the wastes were to disappear and the wastes . . . to be forgoten . . .

"Of all the products made by men, archeologists have found glass to be the most enduring. Obviously glass containers could not be trusted to hold the wastes. But if the wastes could be made a part of the glass itself, they might be very securely locked away from the general environment . . .

"Tests at Professor Eliassen's laboratory have shown that such

New

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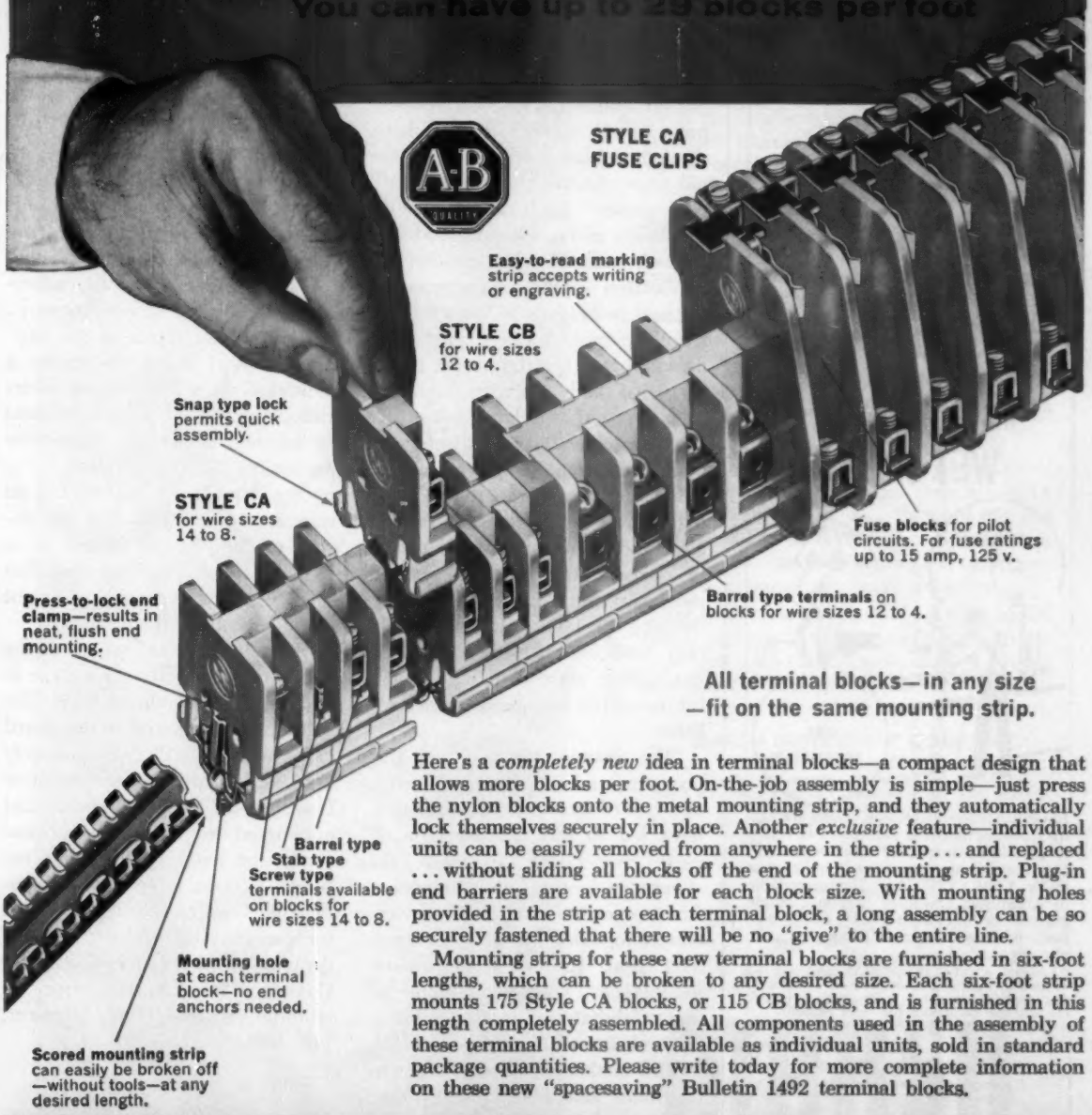
You can have up to 29 blocks per foot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Snap type lock permits quick assembly.
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Barrel type terminals on blocks for wire sizes 12 to 4.
Press-to-lock end clamp—results in neat, flush end mounting.
Barrel type
Stab type
Screw type
terminals available on blocks for wire sizes 14 to 8.
Mounting hole at each terminal block—no end anchors needed.
Scored mounting strip can easily be broken off —without tools—at any desired length.

All terminal blocks—in any size —fit on the same mounting strip.

Here's a *completely new* idea in terminal blocks—a compact design that allows more blocks per foot. On-the-job assembly is simple—just press the nylon blocks onto the metal mounting strip, and they automatically lock themselves securely in place. Another *exclusive* feature—individual units can be easily removed from anywhere in the strip . . . and replaced . . . without sliding all blocks off the end of the mounting strip. Plug-in end barriers are available for each block size. With mounting holes provided in the strip at each terminal block, a long assembly can be so securely fastened that there will be no "give" to the entire line.

Mounting strips for these new terminal blocks are furnished in six-foot lengths, which can be broken to any desired size. Each six-foot strip mounts 175 Style CA blocks, or 115 CB blocks, and is furnished in this length completely assembled. All components used in the assembly of these terminal blocks are available as individual units, sold in standard package quantities. Please write today for more complete information on these new "spacesaving" Bulletin 1492 terminal blocks.

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'atomic glass' is so highly resistant to erosion that boiling distilled water, the most erosive form of water, would take a million years to reduce the diameter of a glass sphere by two inches. Such glass could easily withstand 1000 years exposure below ground without releasing significant radioactivity." – *The Christian Science Monitor*, April 4, 1961.

Engineering Fields to Conquer

"This coming together of the various disciplines has given added impetus to still another trend – new disciplines that bridge across the old ones. Among the most important present fields are those of biophysics and biochemistry which, as their names imply, involve the application of physical understanding and techniques to the study of living systems. Another quite new field is that of health physics. Here, physicists and engineers and life scientists with special training apply themselves to the field of radiation protection. They seek on the one hand to understand the biological results of exposure to nuclear radiation and, on the other, to develop and apply means of measuring such radiation and of devising protection against it. It may well be that many in this graduating class will find their future calling in some of these new fields.

"The vastness of many of the programs and the size, complexity, and cost of much of the equipment have led to still another type of close cooperation. In many instances, scientists and engineers from several institutions work closely together toward some common goal. Examples are almost numberless. I shall give but one. In many laboratories in this country research is under way endeavoring to find methods for controlling the enormous amounts of energy that can be released from thermonuclear reactions, the same as those which in explosive fashion provide the devastating thermonuclear weapons. This is a complex and difficult problem requiring attack from many angles. Should it succeed, the energy that we can tap from the heavy hydrogen in the oceans is almost without limit."– "Cooperation in Scientific and Engineering Research," by Dr. Leland J. Haworth, Commissioner of the United States Atomic Energy Commission, presented as the 89th Annual Commencement Address at Stevens Institute of Technology, June 10, 1961.

Equal Rights for the Engineer

"In recent weeks, considerable attention has been attracted to a decision of the Common Pleas Court of Jefferson County, which is contrary to the public interest in that it restricts the practice of engineering in the design of buildings . . .

"It is not the intent of the engineering profession to impose a limitation upon the practice of architecture, as all engineers have an inherent respect for their sister profession. But it is certainly within the bounds of reason for an engineer to maintain that the design of building structures is in the field of engineering and that the law gives engineers the right to practice therein.

"Therefore, the full weight of the Society must be brought to bear in reaching a favorable decision. The matter was submitted to the Board of Trustees of OSPE, who promptly agreed to appropriate sufficient funds for the immediate needs and authorized the raising of additional funds for legal counsel and expenses in order to appeal the Steubenville Case to the higher courts for the purpose of reversing the decision of the Jefferson County Common Pleas Court." – from an editorial in *The Ohio Engineer*, July 1961.

Conflict of Interest

"There used to be a statue of Civic Virtue in our City Hall Park, an immense, grim, chunky, muscle-bound athlete, with a huge club,

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"In 20 well-organized, concise chapters, the author blends current professional association data with his own 29 years' experience as a principal in a leading Midwest consulting firm. The text, crisp and easily read, is presented from the practical man's point of view.

"The book is divided logically into two parts. Part 1 deals with the consultant's role in society and his relationship with the client. Part 2 studies the internal management of a consulting engineering firm — and this is where Stanley's experience counts heavily. It is obvious that the author took the rocky road to success and hopes to keep others from kicking the same rocks. His candid remarks shed light on such thorny professional issues as what constitutes effective ethical advertising and sales promotion, how to nurture good public and client relations, how to deal fairly with competition, what fee schedule to use, how to hire and fire, which type of organization to use, and many other external and internal engineering affairs. . . ."

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tramping on nets and writhing sirens. Aside from ruining the reputation of an otherwise competent sculptor, this symbol of aggressive and humorless righteousness became the target of public ridicule and derision. Colonel George U. Harvey, as Borough President, announced that Queens, as our most virtuous borough, would give the so-called Fat Boy a happy home. Other individuals muttered something about graven images and the Ten Commandments.

"In the end, I had a hand as City Park Commissioner in moving the Fat Boy to a secluded traffic island off the new Queens Civic Center. Devout prayers were offered that he might somehow by happy accident fall by the wayside in the course of this ignominous transfer. Was this just a revolt against bad art? Or was our citizenry tired of seeing the Fat Boy parade his virtue and flex his muscles?

"In conclusion, since the issue is one of good faith rather than law, I suggest that we add to the oath of office of every official who has to take such an oath, on every level of government, an affirmation something like this:

"I shall accept no favors which will influence my official actions. I shall steadfastly avoid confusion and conflict of public and private business. I shall look to no reward which may reflect upon my conduct in office." – by Robert Moses in *The New York Times Magazine*, July 22, 1961.

"Educated" Engineers

"I keep harping on the need for engineers to be educated as well as trained because I don't believe that specialist training necessarily affects those characteristics of the mind which are needed for human administration. The qualities of imagination, enthusiasm, and compassion are present to a greater or lesser extent in all of us, but it needs the process of a general and liberal education to give them point and direction. Specialist training can give people the ability to make sweeping technological innovations, but it needs a broad and liberal education to enable people to foresee the effects of those innovations and to recognize how to introduce the fruits of modern science and engineering to the best advantage of the people.

"That is the main task for the engineer in the future, and the engineers of the Commonwealth can do this for one-quarter of the world's population. There are immense opportunities for engineers to increase the standards and prosperity of the member countries and it also offers every kind of . . . experience for the enterprising.

"The target we should set ourselves in the Commonwealth is a reasonable material standard for all its people, and the main responsibility for reaching that target will rest on the engineer.

"That, in the end, is the engineer's contribution to Commonwealth development, and it is my hope that the engineers of the Commonwealth will work together to reach that target in a spirit of trust and friendship." – *The Seventh Graham Clark Lecture, 1961*, "The Engineer in Commonwealth Development," by H. R. H. Prince Philip, Duke of Edinburgh.

The Importance of the CE

"John E. Haines, member of the board, discussed the increasing importance of engineers in the building industry at the annual meeting of the Consulting Engineers Council in May. Haines spoke at a special luncheon honoring award winners in the first 'Engineers' Technical and Product Literature Competition,' co-sponsored by CEC and PC. In recognizing that 'the mechanical and electrical engineering facility content of a modern building, alone, usually amounts to from 40 percent to 60 percent of the total cost of the building,' Haines, vice president of Minneapolis-Honeywell, told the engineers that they and building materials man-

This 165,000 Pounds Per Hour Vogt STEAM GENERATOR

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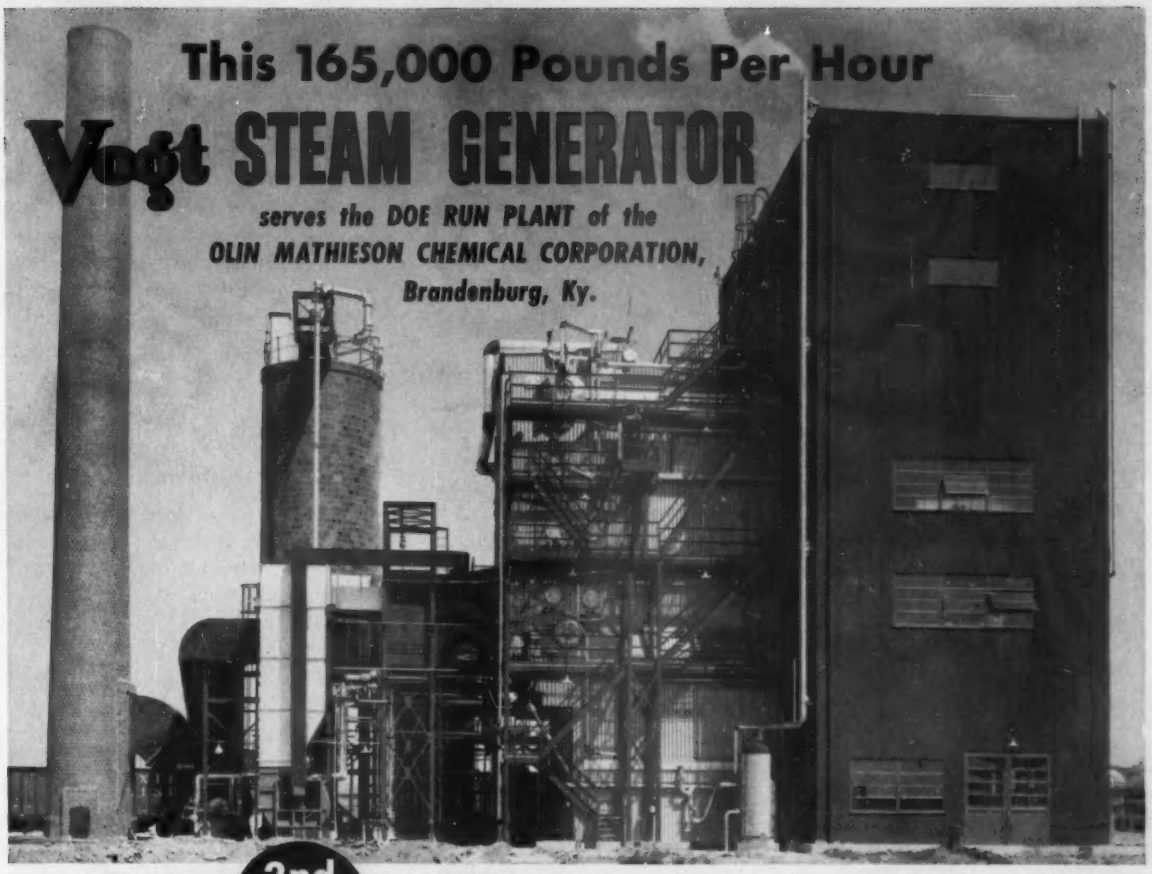

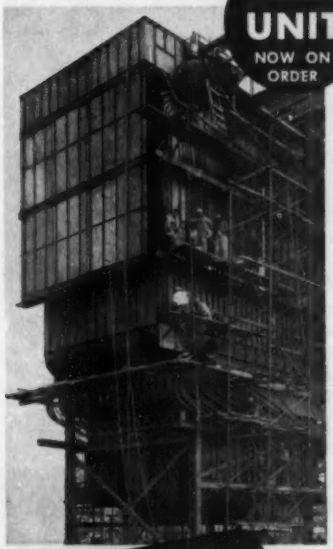

Installed out-in-the-open, the unit generates 165,000 pounds of steam per hour at an operating pressure of 650 psig and 750°F. total temperature when firing pulverized coal or gas in a tangent tube, fully water cooled, pressure tight, steel encased setting.

Outdoor installations, with firing equipment housed, have been promoted by Vogt for many years. They help reduce building and operating costs in leading chemical plants and refineries across the nation.
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BULLETIN B-1400 has many helpful tips to help you select and specify SUMO SUBMERSIBLES for municipal and industrial water supply and in-line booster pump service. Included are construction details and performance data. 3550 and 1750 rpm models.

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ufacturers must work together today even more than in the past." – from the Producers' Council *Newsletter*, June 30, 1961.

Builder Needs CE

"Q. Why should a builder retain a consulting engineering firm?
A. Because a good firm can give him professional services covering a broad range of services. Because it can save him many times the money he spends for these services.
Q. What services, for instance?
A. Site evaluation, land planning, soil testing, house design, structural, and foundation design . . . those are some of the jobs he handles.

He also works out special problems regarding variances and zoning, and prepares reports . . .
Q. Should a builder hire specialists or an engineering firm?
A. It depends. How big a builder is he? Where's he located?

If he's small or medium-sized and operates near a large city, he can readily hire special consultants.

But in a semi-rural area, it's another story. Here's where the smaller builder should retain a firm with a general practice. Local specialists may not be available, and getting one can delay work.

For the very large builders, of course, this whole question is probably academic. But how did they get so big? Early in the game, I'm sure, they called in professional consultants to handle especially tough problems.

They may have started out small, but one thing is certain; they didn't think small for long." – "Should You Use An Engineer?", *American Builder*, July 1961.

British CE's Support Research

"All the important recent advances in civil engineering have originated in some country other than Britain, so the appeal launched this week for £250,000 a year to finance research in civil engineering in Britain is one that the industry can hardly afford to ignore. The appeal has been made by the Civil Engineering Research Council, a new body set up by the Institution of Civil Engineers, the Federation of Civil Engineering Contractors, and the Association of Consulting Engineers. The Department of Scientific and Industrial Research has offered to add nearly as much as the industry itself subscribes to the funds of the council. It does not intend setting up its own research facilities. It has plans similar to those of the new machine tool research association, and will finance projects that originate in universities . . . – *The Economist*, July 8, 1961.

Ideal Fee Distribution

"Following is a summary of what we consider to be the ideal distribution of fees for both direct and indirect costs in our office:

A. Direct Cost:	
1. Drawings	
(a) Preliminary	5 %
(b) Architectural working drawings	18 %
(c) Structural working drawings	3 %
(d) Mechanical working drawings	3.5%
(e) Electrical working drawings	1.5%
	31.0%
2. Inside Supervision –	
(a) Architectural supervision	3.0%
(b) Structural	1.0%
(c) Mechanical	0.7%
(d) Electrical	0.3%
	5.0%
3. Outside Supervision	7.0%
Total Direct Cost	43.0%
B. Indirect Cost	
1. Administration	5.0%
2. Office Salaries	5.0%
3. Promotion	2.0%
4. Vacation and non-charge time	2.0%
5. Overhead	23.0%
6. Profit and Reserve	20.0%
Total Indirect	57.0%

"– From the *Monthly Bulletin*, Michigan Society of Architects, July 1961. ▲▲

Specify the drainline that defies corrosion . . . PYREX® DRAINLINE

If your client pours corrosives down the drain, give him the dependability and durability he needs by specifying PYREX "double-tough" drainline.

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PYREX drainline also drastically reduces maintenance. It neither corrodes nor leaks, so maintenance costs shrivel to almost nothing. Dangerous *hidden* problems that corrosive chemicals produce in metallic piping are eliminated. Plug-ups can be *seen* before complications set in.

PYREX drainline is easy to install. Simple stab-fit, one-bolt coupling . . . light weight . . . fewer hangers, fewer joints . . . no cleanouts or expansion joints—all spell significant savings in installation cost.

There's a lot more, including specs, in Bulletin PE-30. Write for a copy to Plant Equipment Department, 2410 Crystal Street, Corning, N. Y.

see our catalog in Sweet's (S)

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shows electrical characteristics. For any given
breaker, the electrical characteristics are
directly opposite the physical characteristics
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30,000
22,000
Interrupting Rating (Asym) 240 Volts
a-c 480
a-c 600
DC
35,000
25,000
20,000
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Corrosion on the Run . . . Cascading over a waterfall or tumbling from the sky, tiny droplets of water absorb gases from the atmosphere. While aerated water is pleasant to the taste and touch, it vigorously corrodes and destroys boiler tubes, industrial piping systems and processing equipment. Effective deaeration is the best answer to the removal of destructive gases such as oxygen and carbon dioxide. ● Over 75 years ago, Cochrane pioneered the first of many developments in this field with the introduction of the direct contact feedwater heater. Today, with the largest number of deaerator installations in the world, Cochrane continues to research and refine this important requirement of modern power and processing plants. This background is your assurance of proper recommendation and performance. In water conditioning . . . the name is Cochrane. Ask for literature on applications and types of deaerators. Write Cochrane Division, Crane Co. 3112 N. 17th Street, Philadelphia 32, Penna.

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The New Projects

Projects in West Pakistan

The West Pakistan Water and Power Development Authority has begun work on several power, irrigation, and reclamation projects in the Indus, Jhelum, and Chenab River basins — territory made available for development by the 1960 treaty between India and West Pakistan. The $1 billion program includes: engineering and construction of the Mangla and Tarbela dams; construction of seven new link canals; remodeling of a number of existing link and canal systems; construction of four barrages and one gated siphon; placement of 2500 tubewells; and work on open drains and related irrigation works.

Harza Engineering Company International, of Chicago, Illinois, the authority's prime engineer, also is preparing a report analyzing in detail the development potential for the next 25 years — a report which complements an existing 10-year development plan. The report will be comprehensive in nature, covering geography, hydrology, and climate; agricultural, power, and water requirements; a master Indus River plan; and the economics, engineering, and organization of project planning for development of this area.

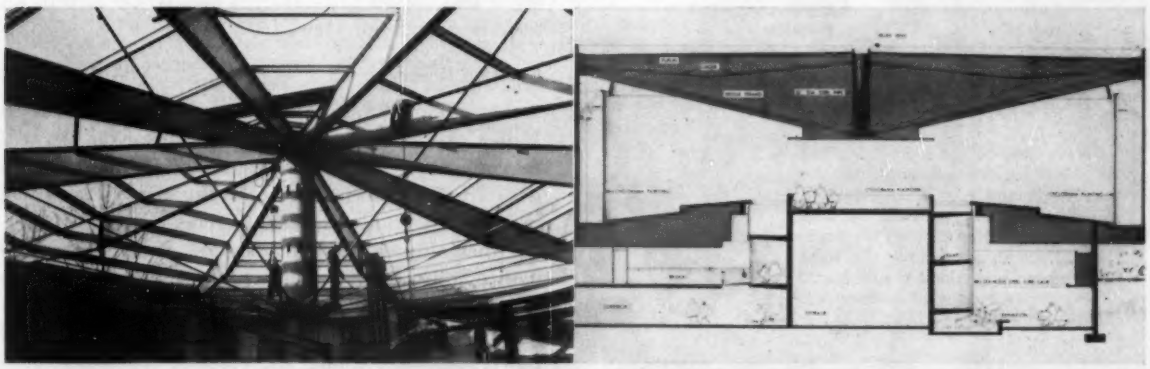
Affiliated with Harza on Mangla Dam are Binnie, Deacon & Gourley, and Preece, Cardew and Rider, both of London. Tipton and Kalmbach, Inc., Denver, Colorado, are the consultants on the new link canal, canal remodeling, and tubewells and drainage projects. The barrages are to be designed by Goode and Partners, engineers, London, England. Hunting Technical Services, London, will do the engineering survey. Tippetts-Abbett-McCarthy-Stratton International Corporation, New York City, is the consultant on Tarbela Dam.

El Salvador Road Program

A four-year, $12 million plan for highway and road construction in El Salvador has been approved by the National Economic Coordination and Planning Commission. The plan, to be financed through the World Bank, includes reconstruction, improvement, and realignment of existing roads as well as the construction of new roadways. Tippetts-Abbett-McCarthy-Stratton Inter-American Corporation, of New York, is advising the government and supervising construction.

Theater Relives Battle

The Cyclorama Building at Gettysburg National Military Park is a cylindrical structure built to accommodate a 19th century painting of Pickett's charge. The painting, 353-ft long and 26-ft high, is



Cyclorama Building at Gettysburg National Military Park has columnless roof formed by tapered steel beams radiating from a central hub. Steel cables running from end of beams to hub maintain equilibrium.

Heavy mobile loadings call for Gary HEAVY-WELD STEEL GRATING

Advanced design of Gary Heavy-Weld Gratings makes them ideal for any installation where heavy-duty open steel flooring is desirable. New design has the capacity to sustain heavy mobile loadings imposed by highway vehicles, lift trucks, and all classes of aircraft. Straight clean lines of the rectangular pattern permit unimpeded flowage and afford maximum open area. Wide range of sizes and meshes makes Gary Heavy-Weld Gratings adaptable for a variety of applications.

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mounted around the inner circumference of the building and is viewed from a center platform. To provide unobstructed vision, a columnless roof is formed by tapered steel beams which radiate from a center hub and rest on the exterior walls. The roof is kept in equilibrium by tensioned cables which are attached to the hub below the beams and to the outer ends of the beams. The structural enginer was Parker, Zehnder and Associates, and the architect was Neutra and Alexander, both of Los Angeles.

Innovations in Public Housing

Bohlman Towers, a $2 million, state-subsidized housing development in Peekskill, New York, has an unusual structural design that does away with inward protruding columns and spandrel beams. Slender rectangular reinforced concrete columns in the exterior wall support the edge reinforced, flat slab concrete floors. The columns are closely spaced, hence a spandrel beam is not needed. The eight-story building is laid out on a "Y" shaped plan which affords all tenants an exterior view.

Bohlman Towers, Peekskill, New York, has slender columns in exterior wall to support flat slab floors.

Tachien Reservoir

A key element in the development of the Tachia Valley, Formosa, is the Tachien Reservoir. It will regulate the natural river flow to feed six power plants with a combined capacity of 1.4 million kw and will provide irrigation for 130,000 acres.

Principal construction includes a main concrete dam of the thin arch type, rising 780-ft high in the Tachien Gorge; a 400-ft high rock filled auxiliary dam to protect a weak left ridge; an underground powerhouse containing six, vertical, 50,000 kw generating units; and a vertical shaft to a switch yard directly above the powerhouse. Generated voltage

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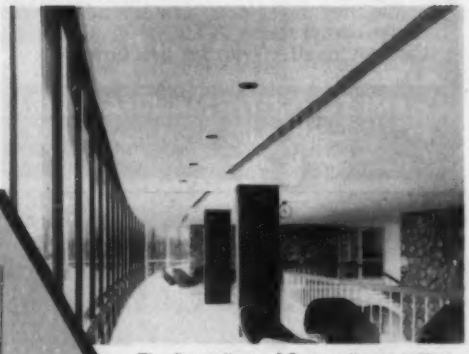

The fluent lines of Connor linear ceiling diffusers accentuate and complement the rich simplicity of the building's interior and provide highly effective air distribution.

In this extremely impressive new I.B.M. building, one assurance of an always suitable climatic interior is a reliable air distribution system made up from Connor's complete line.

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"C-ing" it from the top, the increasingly popular all air system includes Pneumavalve, the exclusive Connor element that's at the heart of the Kno-Draft Series 45P mixing boxes, 350 of which are installed here; 450 sleek linear diffusers; 1200 perforated supply and return diffusers; 130 circular supply diffusers; and 3,230 specially designed snap-in type supply, return, and exhaust registers and grilles. The diffusers, registers, and grilles were supplied in a special color to blend with the interior design and color schemes.

The Connor All Air System—of which Pneumavalve is the indispensable part—offers many advantages of design, function, and economy. Write for information on the complete system or any individual unit. Representatives in principal cities.

In the building's striking auditorium, circular Connor ceiling diffusers are neatly recessed in the same cone-like pockets that hold the overhead lights, another example of how the diffuser adapts to design features yet distributes air in an ideal pattern.

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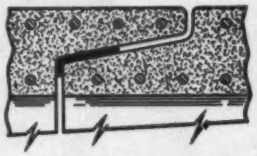

TYLOX "C" Gasket under full compression. Note the visual inspection feature.

"C" Gaskets are of true compression type, made of either rubber or neoprene. They may be installed at the job site, or pre-assembled at the pipe manufacturer's plant. Compounded specially to resist sewerage and industrial waste acids, they never deteriorate. Under ground and under compression, TYLOX "C" Gaskets outlast the pipe itself. Write for brochure.

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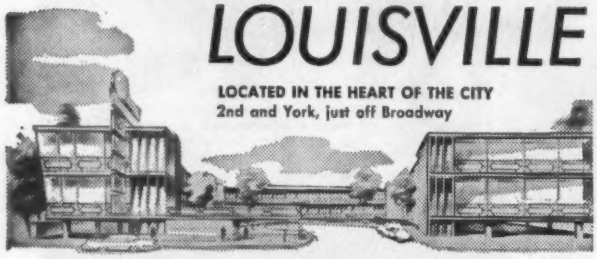

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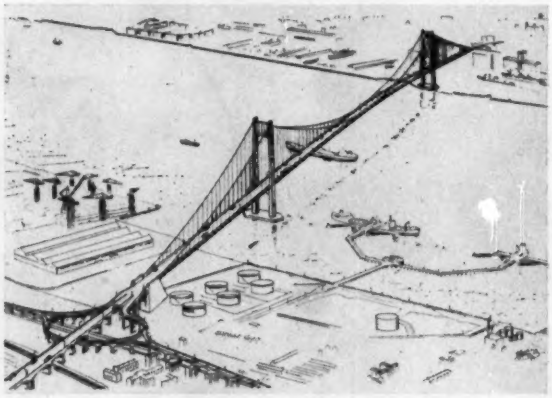
will be stepped up to 154,000 volts for connection to the power grid of the island of Taiwan (Formosa).

Cost of this project is estimated to be $109 million, and it will take six years to complete. The consulting engineering firm for the project is Andre Coyne & Jean Bellier, Paris, France.

Liverpool Traffic Study

Liverpool is reviewing a $60,000 traffic study executed by the traffic engineering firm of W. S. Atkins and Partners for the prime consulting firm of Mott, Hay and Anderson, both firms of London. The study, conducted principally to find out if a second bridge



Liverpool plans $81 million bridge across Mersey River as part of over-all plan to alleviate traffic snarl.

across the Mersey River would reduce traffic congestion, showed that two additional bridges will be needed within the next 20 years to alleviate traffic congestion. However, the engineers selected a single, six-lane suspension bridge as the best immediate solution from among eight alternative plans, including six tunnel and two bridge proposals. The proposed $81 million bridge would be 7750-ft long, with a 4500-ft suspension section supported by two 620-ft high towers, and would provide navigational clearance of 200 feet at high tide.

U. S. Firm in South Africa

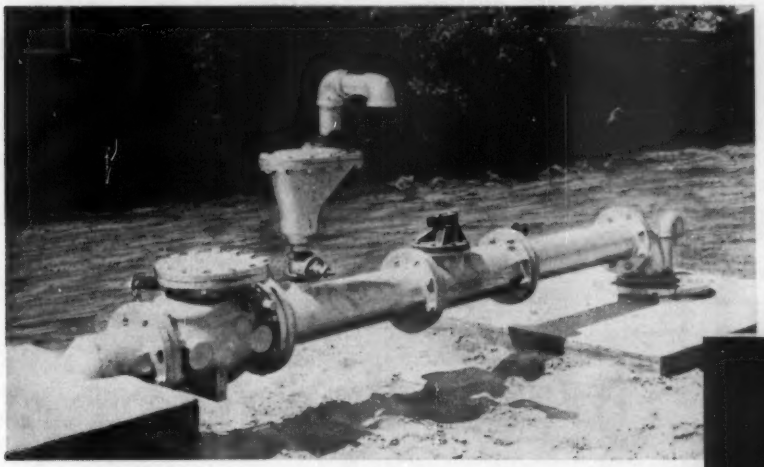
Holmes & Narver, Inc., Los Angeles consulting engineers, have been engaged to design a sewage disposal system for the city of Durban, Union of South Africa. Representatives of the firm have visited the city and will report on the relative merits of both chemical and ocean outfall methods of disposal.

Floating Concrete Bridge

The Hood Canal Bridge, trouble-plagued during construction, finally is finished — one year later than expected. Originally, the joints between each of the 23,

Radio Controlled Water System Uses Johnston Submersibles

The City of Porterville, California, in the famed San Joaquin Valley, comprises approximately 1800 acres, 8,000 people, and one of the smartest city governments in the state. We say that not because the city authorities use our pumps, but because of how they use them.



Quiet Johnston Submersible can be installed in residential areas. No above-ground structure is required and the Johnston is virtually tamper-proof and protected from the elements.

Municipal Water System

Porterville's water comes from eleven deep wells. These feed a pipe line system of approximately 50 miles of AWWA Class 150 pipe ranging in size from 12" to 4" in diameter. For the most part the system is a grid pattern and total water pumped amounts to 3300 acre feet per year.

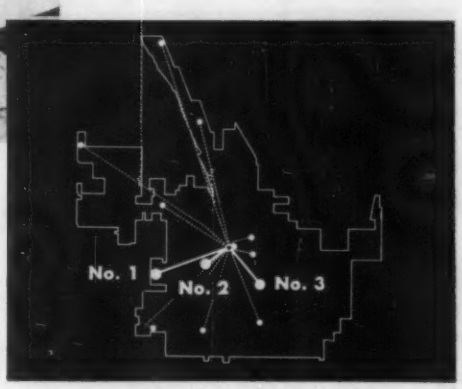
Central Control

In Porterville's Civic Center, a single operator can read the water demand on the system and start or stop any of the eleven pumps by radio. Two of the eleven pumps are Johnston Submersibles and a third is on order. They are 9 Stage—10 DC Bowls, of 75 hp with 230 foot setting and 338 foot dynamic head. Each one is capable of delivering 650 gpm at the radio operator's command.

Johnston Submersible Versatility

In addition to being used as a primary water supply, Johnston Submersibles can also be used (1) as booster pumps where they need only one-third the space needed by ordinary horizontal pumps; (2) as pipeline pumps where they may be horizontally mounted directly in the pipeline; and (3) as angle mounted pumps on steep river banks, in mines, etc., where they may be mounted at any angle from horizontal to vertical.

For further information on applications, operating data, or construction details, contact our main plant, any of our branches, or our distributor nearest you. A qualified field engineer will be available for consultation.



Radio-controlled Porterville, California Water System. Positions 1, 2 and 3 show Johnston Submersible Pump locations. In the system, which distributes approximately 3300 acre feet per year, water is metered at each pump and metered to consumers, allowing an annual audit of quantity production and distribution.

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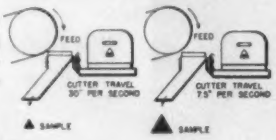

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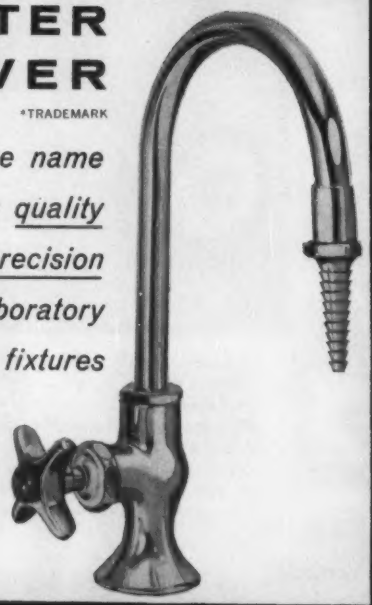

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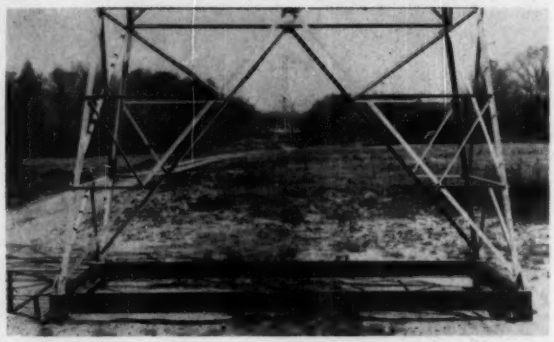
180-ft long concrete pontoons were to be cement grouted and the assemblage then post-tensioned together. Flexural action during construction proved too much for the grouted points, and an epoxy-aggregate mixture was successfully substituted as the jointing material. The epoxy was capable of taking both flexural stresses and compressive loads induced by post-tensioning forces. Howard, Needles, Tammen & Bergendoff, consulting engineers of Kansas City, Missouri, designed the unusual structure.

Foundations Are Computer Designed

With the aid of electronic computers, Stone & Webster Engineering Corporation, New York, has developed a new and cheaper type of transmission tower foundation for use in slack sandy soils. Conventionally, each leg of such a tower is supported



Electronic computer was used in designing new type transmission tower foundation for slack, sandy soils.

by several piles capped with a concrete pad. The new design, evolved by computer logic, uses a single vertical pile under each tower leg, and a rectangular steel frame connecting the tops of the piles.

Plant Expansion

The Interchemical Corporation's Coated Fabric Division, Toledo, Ohio, is adding 40,700 square feet to its existing facilities at a cost of just over $500,000. Expansion is in several directions, and it includes: 27,500 square feet of warehouse space; 1000 square feet of explosive material storage; 5600 square feet of fabric storage; an additional 3000 square feet for the research and development laboratory; and 2600 square feet in the mixing room. Samborn, Steketee, Otis and Evans, are the architects and engineers.

Syrian Irrigation Dam

An irrigation dam in Syria on the Euphrates River is to be built with West German assistance. The project will irrigate approximately the same acreage as Egypt's Aswan project, but will cost $400 million —

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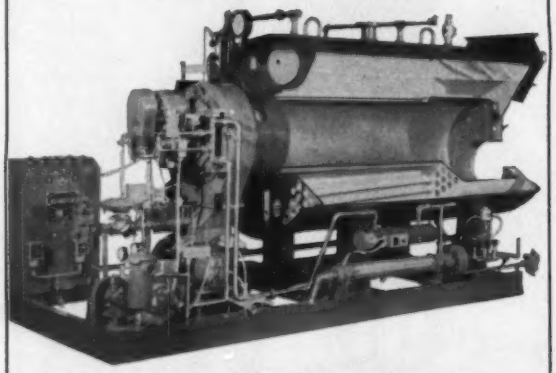

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one-fifth the cost of Aswan. Storage capacity of the dam is to be 25 million cubic feet, and its hydroelectric plant will produce 4 billion kwh annually. Technical and economic feasibility studies on this project were completed by the Soviets in 1960, and it was assumed that they would construct the dam. Some objection is expected from Iraq, which also relies on the Euphrates for irrigation and power.

British Highway Program

The British Minister of Transport has announced to local authorities that $300 million will be made available in the next three years for highway improvement and construction schemes in England and Wales. This is part of a $450 million, 5-year program designed to relieve urban congestion.

Expanded Power Output

A $1.3 million expansion of its existing 4000-kw generating plant will enable Jonesboro, Louisiana, to keep up with current urban growth patterns. Barnard and Burk, Inc., consulting engineers for the project, first ran feasibility studies; then, upon acceptance of their proposal for power plant expansion, began design. A new 1835-kw generator set will boost output some 46 percent, and the existing plant is being rewired to generate at 4160 volts.

Vancouver Sewage Tunnel

The second phase of the 2¼ mile Highbury Street sewage tunnel, which burrows beneath Point Gray Peninsula of Vancouver, British Columbia, is being constructed under air pressure. Because soft silts and trapped water lay in the path of some 7000 feet of the tunnel, the consulting engineer, Dr. Victor Dolmage, specified slightly elevated air pressures within the tunneling excavation to control the flow of soils.

Up to 80 strategically placed deep well pumps allow fast dewatering and permit the contractors to tunnel under comparatively low pressures ranging from 15 to 17 psi. Engineer Dolmage and his associate, Ted Mason, indicate that it is possible to work effectively under pressures up to 50 psi in tunneling work, and many tunnels have required 30 to 35 psi.

Taiwan Technical Aid

Chinese Technical Consultants, an organization composed of some 60 government and private enterprises, enables Nationalist China (Taiwan) to aid Viet Nam, Thailand, Malaya, and North Borneo. Some 120 engineers and specialists are working in these countries to improve textile, cement, paper, glass, chemical, and industrial development. Future plans for aid will affect other Southeast Asian countries, Africa, and perhaps South America. Wang Kou-chi, general manager of Technical Consultants announced plans to set up a branch office in Saigon, Viet Nam in the near

Roof-top Airstream Receiver is the heart of a system which moves bulk chemicals to storage from unloading area 800 feet away. System cuts labor and material costs for new Mill Creek Sewage Works, Cincinnati, designed by Havens & Emerson, consulting engineers, Cleveland.

designing a water or waste treatment plant?

consider the savings possible with air conveying of dry chemicals

If you have had experience with an Airstream Conveyor for dry chemicals, you know the savings it provides to a water or waste treatment plant.

Some of you may be unaware of how an Airstream Conveyor can save money. First, it permits a minimum of 16% savings in material costs through bulk purchasing. Next, it eliminates all but one man from the handling operation—and depending upon how many carloads a month the plant buys, this man may be only part-time. Further, one system will do the complete handling job no matter how many different dry chemicals the plant receives. Finally, it provides streamlined, efficient plant operation with no spillage and waste, no dust in the plant and no balky mechanical equipment with large maintenance bills.

Perhaps you have never specified a Dracco Airstream Conveyor. We believe you owe it to your clients to consider using this modern handling method in your next design. A Dracco engineer will be glad to give you more details. Call or write Dracco Division of Fuller Company, Harvard Avenue and East 116th Street, Cleveland 5, Ohio.

Write today for your Dracco ready reference file. Contains complete guide specs for pneumatic conveyors in water and waste treatment plants.

DRACCO *airstream* conveyors
dust control equipment

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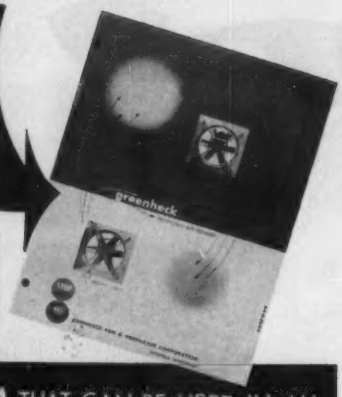
It's yours for the asking . . . you'll find it a booklet of value to your work.



Air Movers THAT CAN BE USED IN ALL COMMERCIAL OR INDUSTRY INSTALLATIONS

Fully illustrated, with a most attractive cover, the booklet illustrated above has all the details you need to know on Greenheck Propeller Air Movers . . . construction features, dimensional data, electrical characteristics, performance chart — on both Greenheck Belted Propeller SB-Line Air Movers . . . Greenheck Direct Drive SD-Line Air Movers . . . and Greenheck Economy Line Air Movers — with accessories illustrated. It's definitely the information you'll want to have handy for quick reference.

Greenheck Propeller Air Movers are designed for a wide range of applications.

- Factories • foundries • paper mills
- Power plants • garages • farm buildings
- Schools • gymnasiums • motels
- Laundries • dry cleaning plants

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future. Emphasis in Viet Nam is placed on textile and cement industrial development, while sugar production and technology in Malaya, and forestry in North Borneo are being stressed.

United Kingdom Reservoir

The Balderhead Reservoir, being built for the Tees Valley and Cleveland Water Board, will be one of the largest in Great Britain. Designed by Edward Sandeman, Kennard & Partners of Westminster (England), the reservoir will be contained by an earthen embankment 150-ft high and 300-ft long, containing some 3 million cubic yards of fill. Costing $7.2 million, the 4 billion gallon reservoir will provide water to meet increasing demands of the chemical and steel industries at Teeside.

Iraq's First Paper Mill

A 40,000-ton capacity paper mill, using reed as the principal pulp material, is being planned for Iraq. Scandiaconsult, a Swedish consulting engineering firm, and the Canadian engineering firm of Stadler Hurter International, Ltd., are collaborating on the design and project supervision. Construction will begin in early 1963, with completion scheduled for late 1965.

Aluminum Dome

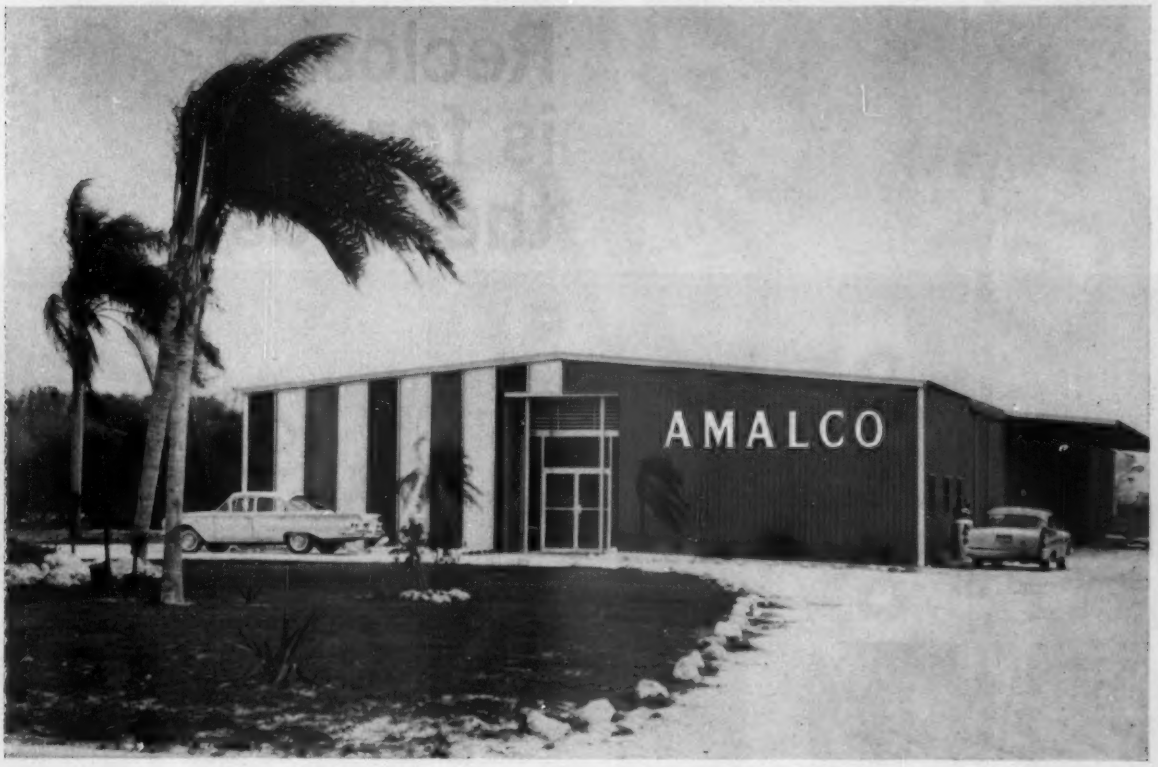
A 56-ft diameter free-span aluminum dome, with a rise of 12½ feet above the spring points, will be erected over the public banking area of the new branch office of the First American National Bank of Nashville, Tennessee. It is composed of geometrically deformed aluminum sections which, when connected, form a self-supporting domed surface. The designer is John A. Preston and Associates, Nashville. W. F. Holt and Sons is the general contractor.

Allbetong Box Frame Structures

Allbetong (all concrete) box frame construction is being applied on a large residential development in Malmo, Southern Sweden. Here, some 720 apartments in five buildings, ranging from 5 to 25 floors in height are being precast on the job. This technique was developed in the early '50s by AB Skanska Cementjutereit, a large Swedish engineering and contracting firm. This method is reported to reduce building costs substantially.

Water for Freetown

Construction is under way on a 900-ft long, 190-ft high earth dam in the Guma River Valley, Sierra Leone, Africa. The project, as designed by Howard Humphreys and Sons, British consulting engineers, will impound some 4.4 billion gallons of water as a supplementary source for the City of Freetown, capital of Sierra Leone. ▲▲



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American Aluminum Company makes a product and meets its public in a single Stran-Steel building! Pre-engineered Stran-Steel gives a maximum of column-free space for fabricating operations, plus plenty of room for attractively panelled salesrooms. The building's modern low-pitched roof is a striking addition to the community, increases its customer appeal, too. And exterior panels—with a choice of 10 colorful Stran-Satin peelproof coatings—will stand up to tropical weathering for years. Easy to buy, dual purpose Stran-Steel buildings can be financed under your Stran-Steel contractor's low-cost "package deal" plan. Call him today—he's listed in the Yellow Pages under *STEEL BUILDINGS* or *BUILDINGS, STEEL.*

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American Aluminum Company of Bradenton, Florida, fabricates storm windows, doors and carports in a modern, attractive LR 60' x 194' Stran-Steel building, shown at top in Stran-Satin Blue.

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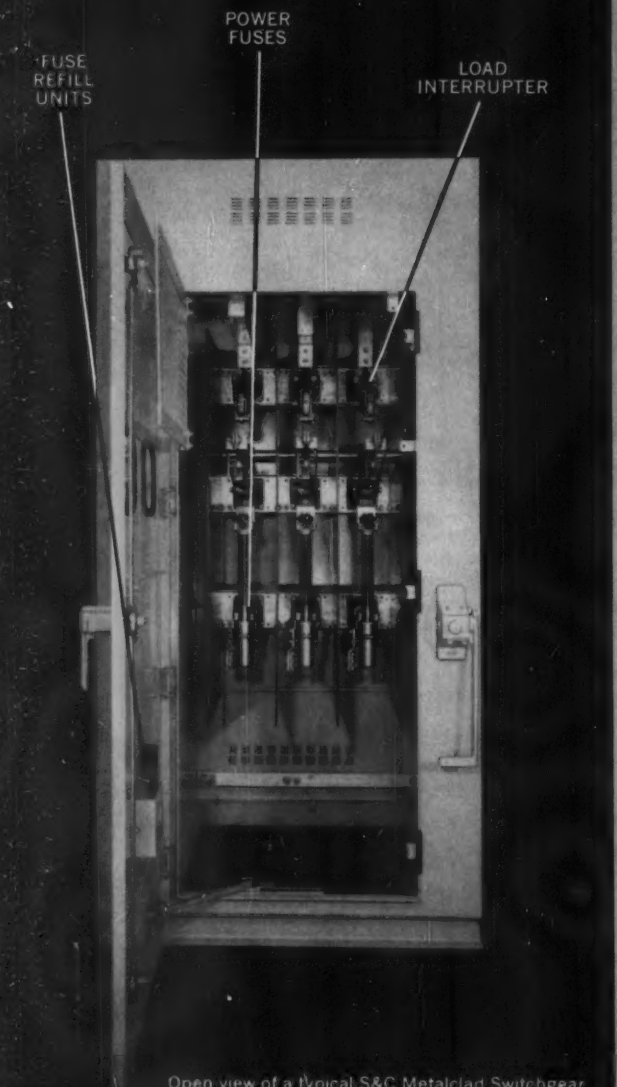
Reclosing is for the birds



Open view of a typical S&C Metalclad Switchgear bay. Note power fuses, load interrupters. Fuse refill units are conveniently stored in the door.

So why buy this feature in your 2.4 thru 14.4-kv switchgear?

Reclosing is for the birds, squirrels, tree limbs, lightning, icing, windstorms, and kite strings that frequently cause non-persistent faults on open distribution lines of utility systems. Reclosing re-energizes the lines to restore service in a fraction of a minute.

But when faults occur on the enclosed power supply circuits of industrial plants, commercial and institutional buildings, you don't want to reclose on them. These faults —while extremely rare—are permanent. Someone has to locate the trouble and repair the equipment or cable—or at least isolate it—before the system can be re-energized. So why buy expensive circuit breaker type switchgear with its automatic reclosing feature?

S&C Metalclad Switchgear—employing fused load interrupters—gives the ideal protection for enclosed power supply circuits. Power fuses furnish the fault protection (load interrupters switch the load). After a fault occurs, you simply replace the inexpensive fuse refill unit (typically costing $13.50) while the fault is being located and corrected.

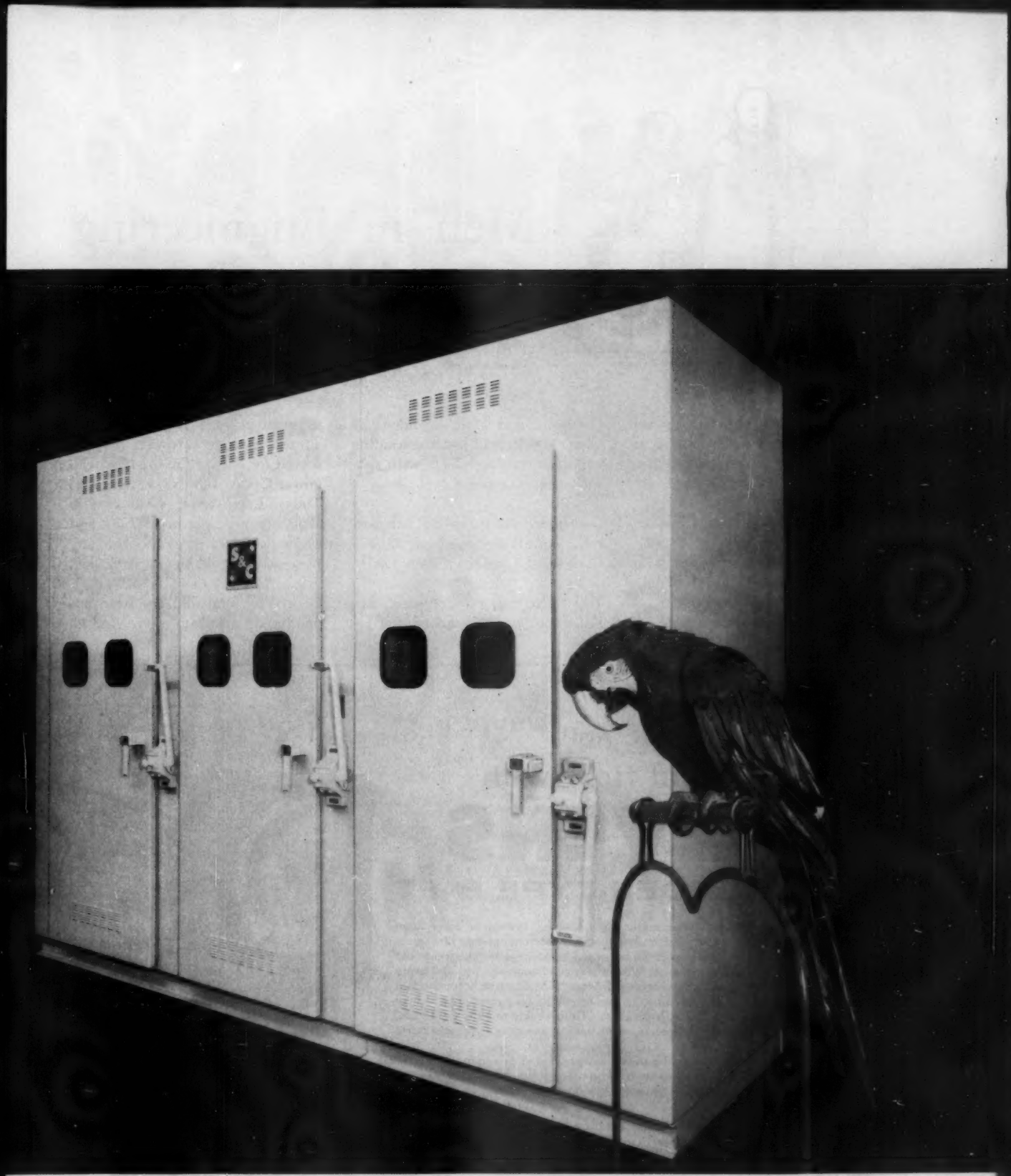
The economics all say, "Reclosing is for the birds." Why pay for a function you can't use?

Cut your high-voltage switchgear costs in half by specifying S&C Metalclad Switchgear for your 2.4 thru 14.4-kv switching centers, service entrances, substation primaries and secondaries. Get full-load switching to 1200 amperes and fault interrupting to 500,000 kva.

See the Yellow Pages (Electrical Equipment) for your nearest S&C sales engineer. Or write to:

S&C Metalclad Switchgear meets all NEC requirements for fault-closing, short-circuit interruption. Performance proved by high-power testing at KEMA laboratories.

S&C ELECTRIC COMPANY
4436 Ravenswood Avenue • Chicago 40, Illinois
Specialists in High Voltage Circuit Interruption since 1911



The equipment is an S&C Metalclad Switchgear Assembly rated 13.8 kv, for a switching center.
The bird, a green-winged macaw, is an optional extra, obtainable at your local petshop.

Men in Engineering

The Consulting Engineers Association of California has moved its executive office and staff facilities to 1355 Market Street, San Francisco 3, California.

John H. Melvin has opened practice as a consulting geologist with headquarters in Pittsburgh, Pennsylvania. Formerly general manager of the Pennsylvania Drilling Company and State Geologist of Ohio, Melvin will assist consulting engineers and architects with subsurface problems.

New address of Edward J. Adamec, P.E., consulting engineer, is 175 Rock Road, Glen Rock, New Jersey.

Tudor Engineering Company, San Francisco, has announced the retirement of Rear Admiral Carl A. Trexel, vice president. Trexel served for 33 years in the Civil Engineer Corps, U.S. Navy; he joined Tudor Engineering Company in 1953, became a partner in 1954, and a vice president when the company was incorporated in January 1960.

George L. Bonvallet has been appointed an associate of Howard C.

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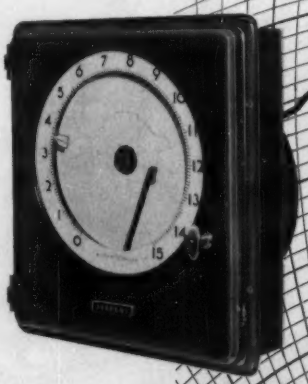
of liquid flow with

STEVENS

RECORDER TYPE B-FT



Recording, indicating and totalizing meter for measuring sewage or other flows over Parshall flumes and weirs. This instrument has interchangeable flow cams and flow conversion gears . . . an important factor to consider for sewage treatment plants in rapidly growing communities. With a simple change of cams and gears the Type B-FT Recorder can operate with a different size flume or accommodate a greater range of flow than that for which it was originally purchased. The change does not require factory service. Similarly, change from weekly to daily time scale, or vice versa, is accomplished by merely repositioning one gear — no new parts to buy.

This recorder can be direct float operated or remotely controlled and is available for wall or switchboard mounting, or with cabinet for mounting out of doors directly over the float well. Request BULLETIN 25 for complete details.

STEVENS HYDROGRAPHIC DATA BOOK

Invaluable for your reference file. Contains technical data on recorder installations, plus a wealth of hydraulic and conversion tables. $1 copy. (No COD's)

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#1 plus *insulating cement can take it*

Heat protection hits a new high in B-E-H #1 Plus Insulating Cement for uneven surfaces, fittings, pipes and valves. Now effective up to 2100 F . . . B-E-H #1 Plus provides a comfortable margin of protection that insures excellent thermal efficiency even on installations not normally subject to super-high temperatures.

Plus in performance – the more resilient fibers and special binder developed by B-E-H research produce a whiter finish that looks better – handles easier – sets smoother.

Plus economy – priced dead-level with other high-quality insulating cements. B-E-H #1 Plus provides an additional 300 F of effective insulation, a whiter, smoother finish, and easier mixing and handling. It pays to specify B-E-H #1 Plus for every job.

For complete technical data and name of your nearest qualified Baldwin-Ehret-Hill distributor-contractor, write: Baldwin-Ehret-Hill, Inc., Room 601 Trenton 2, N. J.

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Manufacturers of a complete line of pipe, block, felt and blanket insulation for temperatures from near absolute Zero to 2100 F.

Hardy and Associates, consultants in acoustics, Chicago, Illinois.

Leonard Spiegel, formerly an associate of Barstow & Mulligan, New York City bridge consultants, has been named chief structural engineer of Konski Engineers, Syracuse, New York.

The Austin Company, engineers and builders, Cleveland, Ohio, has announced the formation of a new division to provide specialized service to the chemical process industry, with headquarters at 2719 Chicago Avenue, Chicago Heights, Illinois. James E. Iliff is manager of the new process division; M. Rex Wingard, division sales manager; and Harry M. Betzig, assistant division manager.

John G. Cappozzo has been named vice president of the architectural division of Johnson & Johnson Engineers-Architects, Inc., Chicago. Cappozzo, formerly manager of the division, will be active in new business development for the firm.

Edward Matthews, formerly a supervising engineer with Esso Standard Oil Company, has joined the business department of Ford, Bacon & Davis, Inc., New York engineering and management consulting firm.

MATTHEWS

ZIEL

Herbert E. Ziel, associate in charge of air conditioning and ventilating for Albert Kahn Associated Architects and Engineers, Inc., Detroit, was elected chairman of the Air Conditioning in Industry Committee of the American Society of Heating, Refrigerating and Air Conditioning Engineers, at its recent national convention in Denver.

Rigdon Currie and Sanford M. Roberts, both of whom were formerly associated with TRW Computers Company, have joined Bonner & Moore Engineering Associates, Houston, Texas, to help organize a process analysis and control activity. B & M specializes in the practical application of mathematics and computers to industrial problems.

The architectural-engineering firm of Adrian Wilson and Associates, Los Angeles, California, has been awarded a Certificate of Appreciation by the Director, Pacific Division, Bureau of Yards and Docks. The citation is for exemplary services rendered the U. S. Navy, the Air Force, and the Republic of the Philippines in connection with

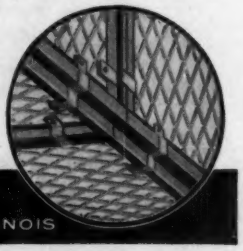
GLOBE SAFE·GARD EXPANDED METAL
(FORMERLY HILMAR)
PARTITIONS with exclusive
QUIK-ERECT patented fittings

...will answer all your enclosure problems

Here is the new, easier, simpler method of guarding conveyors and machines and for all in-plant partitioning. Shipped READY for erection, no cutting, drilling or welding required . . . these interchangeable expanded metal panels provide greater safety, cut overall costs, cover a wider range of use and require 85% less storage space.

EXCLUSIVE QUIK-ERECT SECTION CLIPS save much of the erection time formerly required. Proven successful in hundreds of installations, these Safe·Gard panels are of welded construction, give longer life, are more rigid and stronger than wire, will not ravel or fray.

Note enlarged detail showing SAFE·GARD Quik-Erect Clips securely joining the interchangeable panels.



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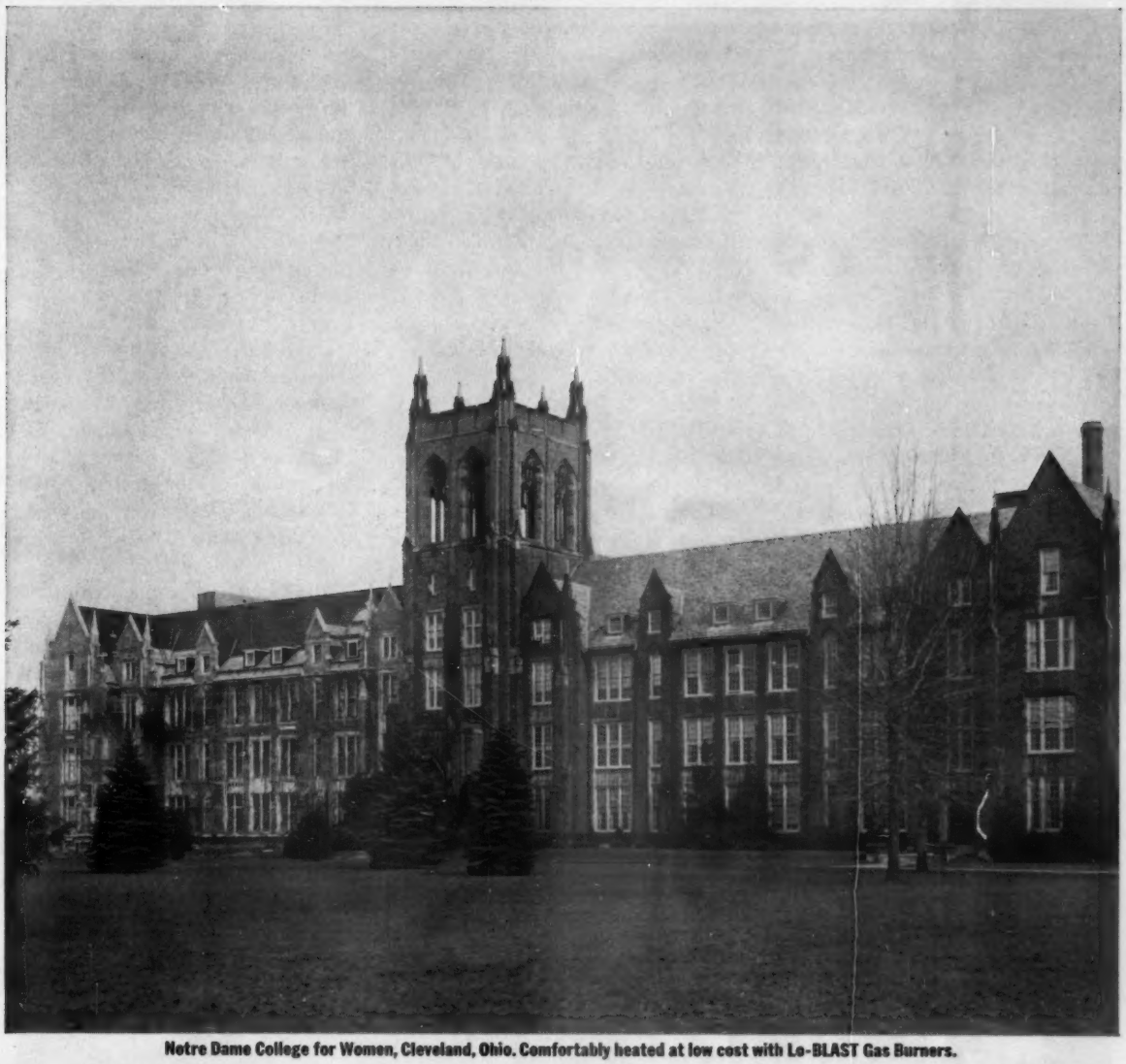
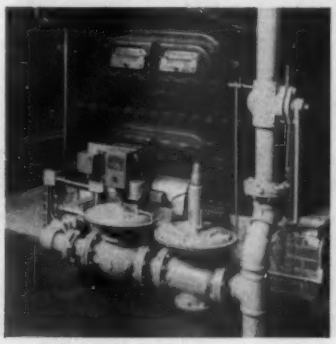


Notre Dame College for Women, Cleveland, Ohio. Comfortably heated at low cost with Lo-BLAST Gas Burners.

Saves $2,000 a year on fuel costs, heating with LO-BLAST GAS burners

"Five years ago we converted to gas with Lo-BLAST Gas Burners to fire the boilers for our heating system. Since then we have saved at least $2,000 a year on fuel costs alone," says Bernard Muhle, Building Superintendent at Notre Dame College for Women. "On cool mornings in Fall and Spring, this gas equipment gives us quick heat for short periods, without wasting fuel on long warm-ups."

You save on maintenance and installation, too, with versatile Lo-BLAST Gas Burners. They adapt easily to any boiler or furnace. All components are outside the firebox for easy access. The *gas*-fired burners operate automatically with forced air injection, independently of variable chimney drafts. You get greater combustion efficiency with all the convenience, safety, dependability and economy of modern gas heating.



The Lo-BLAST Gas Burners (foreground) which fire these boilers at Notre Dame College for Women, can generate 3 pounds of steam pressure within 5 minutes. No long, costly warm-up. Economite and Lo-BLAST Gas Burners are available in capacities from 70,000 to 20,000,000 BTU p/h.

For information on Lo-BLAST Gas Burners – and their small counterpart, the Economite – contact your local Gas Company, or write to Mid-Continent Metal Products Company, 2717 Greenview Avenue, Chicago 14, Illinois.

American Gas Association

FOR HEATING... GAS IS GOOD BUSINESS!

architectural and engineering construction contract performance.

The Fluor Corporation, Ltd. has announced name and location changes for its New York engineering subsidiary, Singmaster & Breyer, Inc. The new name is Fluor-Singmaster & Breyer, Inc. — the address is 100 Park Avenue.

Lawrence Ehlers and Hubert Casper have opened an office for the practice of consulting engineering at Junction City, Kansas. The new firm will specialize in survey and plat work, structural design, highway and bridge planning, and sewer design.

J. D. Kirkgard has been named an associate of LeRoy Crandall & Associates, consulting foundation engineers, Los Angeles. Kirkgard has been with the firm for six years.

Robert Scherrer and Hans Baumann have formed a partnership to be known as Scherrer-Baumann & Associates, Structural Engineers. Offices are at 1224½ N. Broadway, Santa Ana, California.

William Lewis has been elected second vice president of Alderman and Swift, consulting engineers of South Pasadena, California.

Harold Perla has been promoted to assistant chief engineer, special projects division, Holmes & Narver, Los Angeles, California.

Richard S. Tveter has been named principal mechanical engineer of S. Himmelstein and Company, consulting engineers, Chicago. Tveter has had 10 years of engineering experience; most recently he was serving as the chief engineer of the Data-Stor Division of the Cook Electric Company.

David C. Liu has been admitted to the general partnership of Dames & Moore, Los Angeles. Liu began his career with the firm in Seattle and occupied several positions in several offices, including the positions of research engineer and quality improvement engineer. Presently, Liu is in charge of the firm's Honolulu office.

Cleverdon, Varney and Pike, consulting engineers, Boston, announces the appointment of William H. Connolly as director of the prestress design division of its structural engineering department. Connolly formerly was chief structural engineer of Goldberg, LeMessurier and Associates, and is the author of the recently published book *Design of Prestressed Concrete Beams.*

Walker Lee Cisler, P. E., president and board chairman of the Detroit Edison Company and past president of the American Society of Mechanical Engineers, was honored by his fellow professional engineers of Michigan as their se-

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SKY-BLAST®
ROOF VENTILATORS!
Powerful exhaust keeps out rain, snow, sleet. SKY-BLAST needs no throttling weather covers, so more air is moved at less cost. Wind velocity or direction can't affect performance. At rest, butterfly dampers form watertight seal. Other weatherproof features include: galvanized heavy gage steel surfaces . . . nonclogging rainshed . . . low wind guard . . . rugged base and condensate drain. Ratings to 78,000 CFM. Write for Bulletin 680-CE
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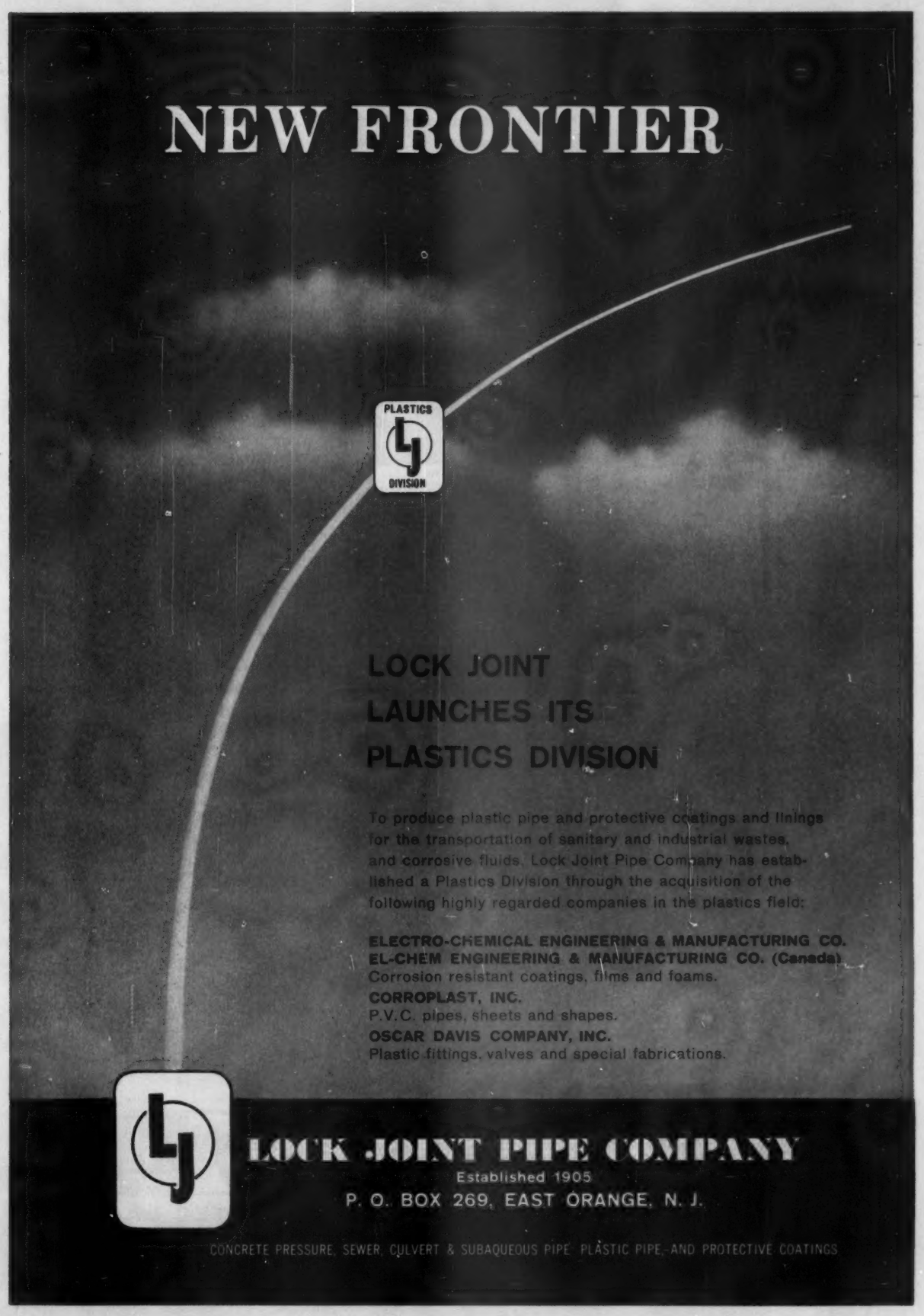
NEW FRONTIER



LOCK JOINT LAUNCHES ITS PLASTICS DIVISION

To produce plastic pipe and protective coatings and linings for the transportation of sanitary and industrial wastes, and corrosive fluids, Lock Joint Pipe Company has established a Plastics Division through the acquisition of the following highly regarded companies in the plastics field:

ELECTRO-CHEMICAL ENGINEERING & MANUFACTURING CO.
EL-CHEM ENGINEERING & MANUFACTURING CO. (Canada)
Corrosion resistant coatings, films and foams.
CORROPLAST, INC.
P.V.C. pipes, sheets and shapes.
OSCAR DAVIS COMPANY, INC.
Plastic fittings, valves and special fabrications.

LOCK JOINT PIPE COMPANY

Established 1905

P. O. BOX 269, EAST ORANGE, N. J.

CONCRETE PRESSURE, SEWER, CULVERT & SUBAQUEOUS PIPE PLASTIC PIPE AND PROTECTIVE COATINGS

lection for the "1961 Engineer of the Year" award.

William M. Crawmer has been made senior pulp and paper mill staff consultant of The Rust Engineering Company, Pittsburgh. Crawmer joined the firm in 1959 as a staff consultant to specialize in the design and construction of pulp and paper mills.

New address of Henningson-Durham-Richardson architects, engineers, and planners, is 3555 Farnam Street, Omaha 31, Nebraska, a building designed by HDR.

Frank H. Newnam, Jr., a member of the firm of Lockwood, Andrews & Newnam, consulting engineers, Houston, will head the Texas Section of the American Society of Civil Engineers for the coming legislative year.

The New York Chapter of the American Institute of Architects recently presented its 1961 Award of Merit to Othmar H. Ammann, of Ammann & Whitney, for his distinguished engineering work in large bridge construction. His work includes the George Washington Bridge, Triborough Bridge, Whitestone Bridge, Throgs Neck Bridge, and the Narrows Bridge, all in the New York City area.

AMMANN

HAWKE

James P. Hawke, consulting structural engineer, has opened an office at 503 Market Street, San Francisco. Hawke has just completed supervision of the design of the $188 million Volta River hydroelectric project in Ghana, Africa.

Dr. Carlisle M. Thacker has resigned his position as technical director of Taylor Fibre Co., Norristown, Pennsylvania, to engage in consultation on technical and economic matters pertaining to chemicals and petrochemicals. Dr. Thacker's offices will be located at 77 N. Forge Mountain Drive, Valley Forge, Pennsylvania.

At its recent annual awards and installation banquet, the Consulting Engineers Association of Washington presented its Consulting Engineer of the Year award to Cecil P. Arnold for his work in advancing the profession. The board of directors and officers for 1961-62 were installed and the following men were elected to the board: president, Norman Carson, R. W. Beck & Associates; vice president, Joseph Lamont, Dames & Moore; secretary, Charles R. Lyon, Ruskin

Altec Sound Contractor to Myers Park Baptist Church: Southeastern Sight & Sound Corporation, Charlotte, North Carolina

Sound Solution to a Sound Problem:

CHURCH SOUND SYSTEM BY ALTEC

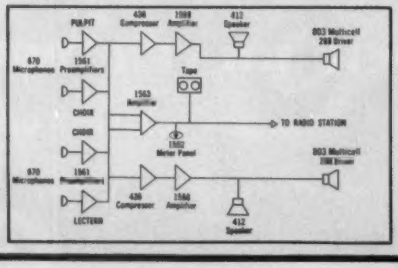
Specified for Myers Park Baptist Church, Charlotte, North Carolina

CASE HISTORY FILE 61-19: An expansion and improvement program at Myers Park Baptist Church included replacement of an unsatisfactory sound system.

SOUND PROBLEM: The new sound system was to excel in voice-range services for clear reinforcement of speech and choral presentations. In addition, the system had to offer quality that would meet critical FCC broadcast requirements so church services could be transmitted to a radio station for broadcast.

SOUND SOLUTION BY ALTEC: A customized voice-range Altec church system was installed. It provides the flexibility of single or dual (stereo) channel operation, clean signal for remote broadcasts, and automatic control of volume within a pre-set level regardless of varying voice intensity at the microphones.

LET ALTEC SOLVE YOUR SOUND PROBLEM: With over 200 modular audio components, Altec offers specialized solutions to most audio applications. Altec products may be assembled into custom systems to perform specific services in widely diverse fields such as airports, arenas, office and industrial buildings, warehouses, concert halls, broadcast and recording studios, theatres, auditoriums, churches, and schools. Investigate the advantages Altec offers your clients — merely call the nearest Altec Sound Contractor (listed in your Yellow Pages) or write Dept. CE-10.



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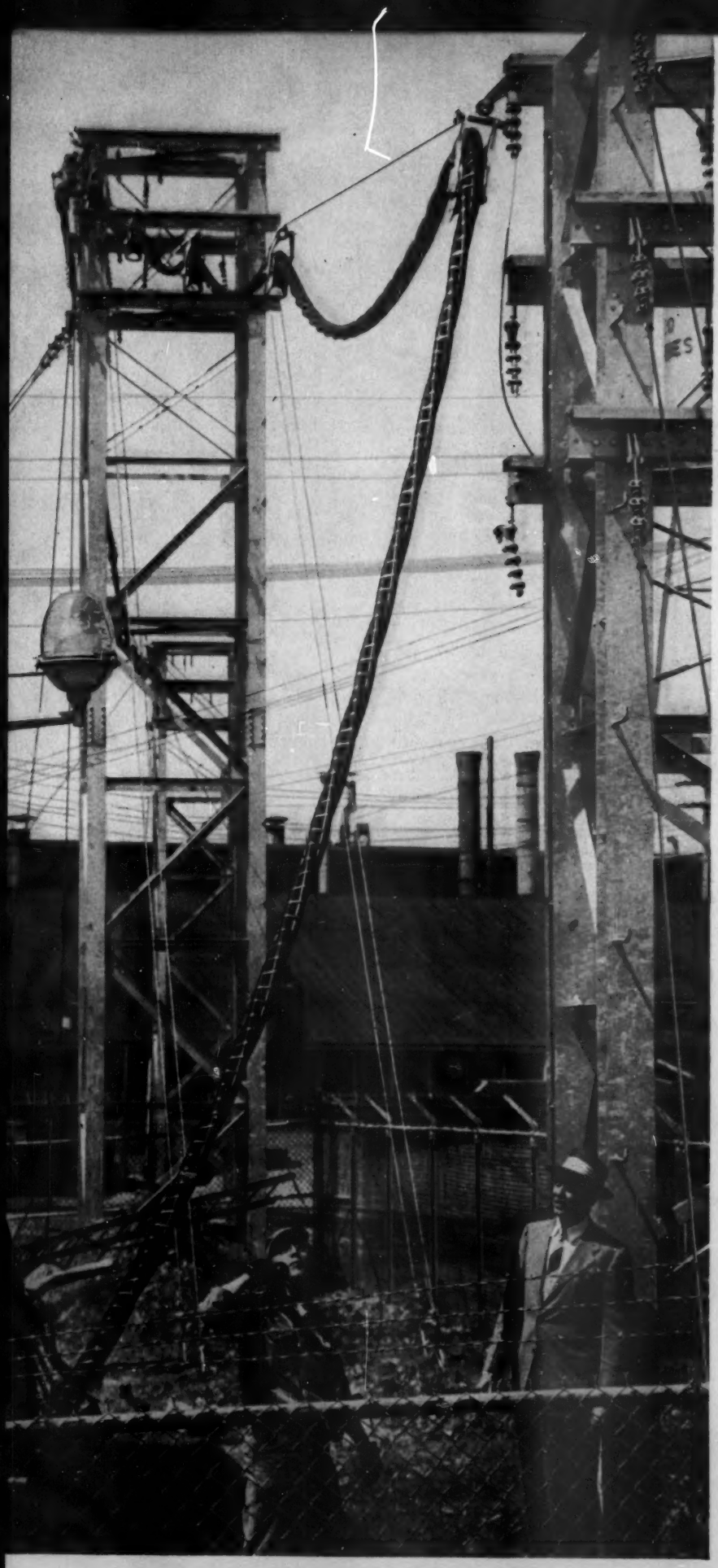

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Fisher & Associates; treasurer, Allen Hill, Hill & Ingman; director to Consulting Engineers Council, Milton Cook, Tracy, Cook, Brunston & Dudley. Harrison Kramer, Carey and Kramer; and Peter Hostmark, Hostmark & Associates, were elected to the board of directors.

Clinton Bogert Engineers, New York City, announce the retirement of Clinton L. Bogert.

Luther W. Graef, Leonard P. Anhalt, and Robert E. Schloemer announce the formation of Graef, Anhalt & Schloemer, for the practice of structural engineering. Offices are at 6340 West Fond du Lac Avenue, Milwaukee 18, Wis.

John P. Maurer has joined Astra, Inc., Raleigh, North Carolina, as an associate. Maurer, a nuclear engineer, has had specialized experience in the nuclear rocket field, including design responsibilities for cryogenic and water cooling of headers, piping, and system components for nuclear rocket tests.

Deane M. Truesdell, architect, Flint, Michigan; and Ellis, Arndt & Associates, consulting engineers and landscape architects, Flint, announce the formation of the firm of Ellis, Arndt & Truesdell. Offices are located at 614 MacArthur Building, 114 W. Union Street, Flint 2, Michigan.

Mott, Mobley & Horstman, architects, Fort Smith, Arkansas, announce the admission of Eugene L. Staton, structural engineer, as a partner and a change in the firm name to Mott, Mobley, Horstman & Staton.

Among the 17 members of the American Institute of Electrical Engineers recently elevated to the grade of Fellow, was Bruce J. Ennis, associate, Burns and McDonnell Engineering Company, Kansas City, Missouri, "for contributions to the design and construction of electric supply systems."

John E. Everson has been elected to partnership of Parsons, Brinckerhoff, Quade & Douglas, New York City, and John O. Bickel has retired as a general partner.

John C. Sprague has opened an office at 104 Oakmont Drive, Marietta, Georgia, for the practice of consulting in concrete technology. Sprague was associated with Lock Joint Pipe Company as consulting concrete engineer.

New officers, elected to serve during 1961-62, of the Structural Engineers Association of Oregon are: president, Robert R. Adams, Corvallis; vice president, Cyril Burgstahler, Portland; secretary-treasurer, Carl Rohde, Oswego; directors, Neil D. McGee, Portland, and W. T. McCalla, Harrisburg. Holdover director is Donald R. Kramer, Vancouver. ▲▲

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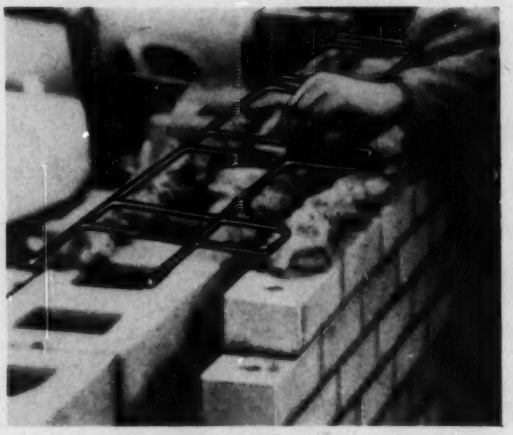

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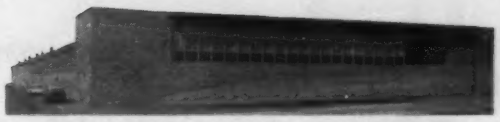

Modern 460' x 200' plant of the C & M Envelope Co.
Architects: Nathan Siegler & Son, Newark
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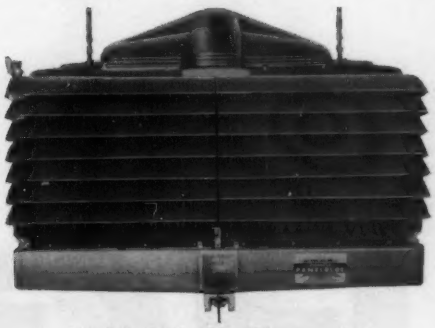

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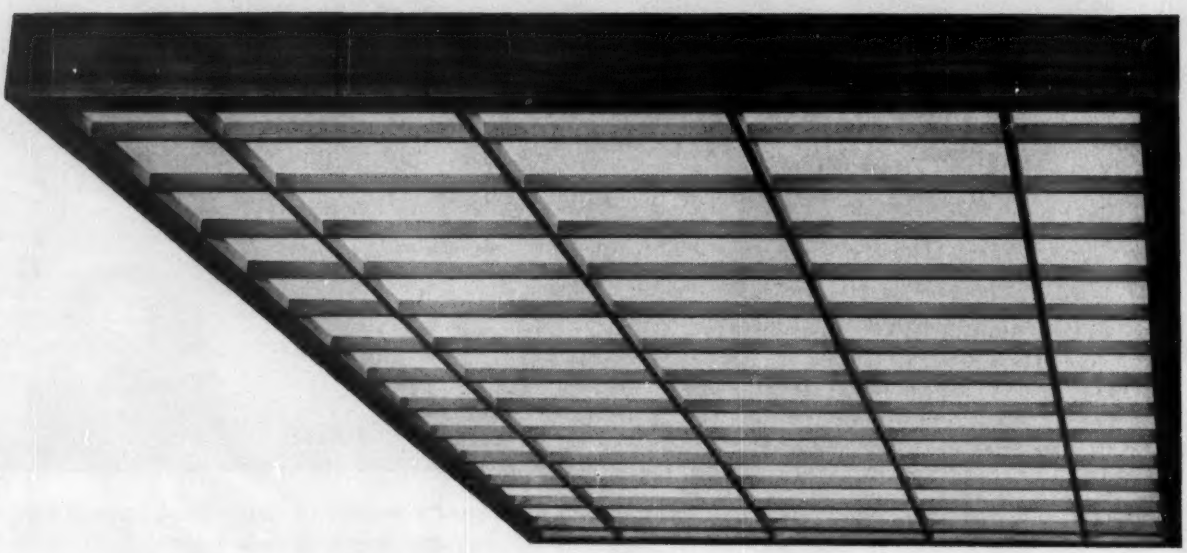

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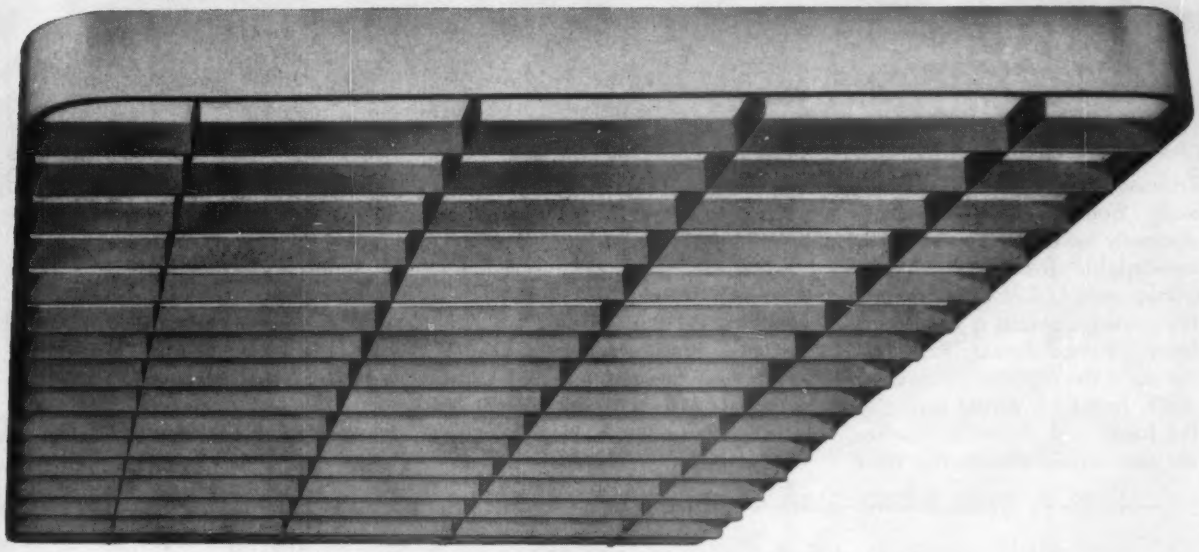

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Rain Forests, Rockets, And Reminiscence

The Forest and the Sea, by Marsten Bates; Random House, New York; $3.95.

Professor Bates writes clearly and easily from his own experience, obviously savoring details of the inescapable interrelationships among men, animals, and plants. His primary interest is in the similarity between the rain forest and the sea – the different animals and plants found at varying heights in the forest and depths in the sea. He also writes briefly, but interestingly, of other forms of life in other parts of the world: lakes, rivers, deserts, prairies, and jungles (which are not to be confused with rain forests).

Unfortunately, the publishers, in making up the dust jacket, presented the author's thoughts a little out of context; they would have you believe he is a philosopher. He is not. He is (if he must have a title) a naturalist, a biologist. As does any man who make a serious study of life, Professor Bates concerns himself with man's place in the universe. He also concerns himself with the place of the starfish and of the butterfly. That does not make him a philosopher.

Perhaps, at one point, he becomes a philosopher after all. He tells of the many times he is asked to identify some specimen. Not satisfied with mere identification, the questioner goes on to "Where does it live?" and "What does it do?" Invariably comes "What good is it?" Bates' stock answer to that: "What good are you?"

•

Rings Around the World, by Heinz Gartmann; William Morrow & Co., New York, N.Y.; $5.95.

Heinz Gartmann is a German engineer who has written many articles for technical journals. In 1950, he founded a scientific magazine for the advancement of rocket technology. His new book, which is essentially a history of transportation and communication, was widely aclaimed when first published in Germany and has since appeared in England, Italy, Denmark, and Sweden. The English translation was handled by Allen G. Readett.

As with any technological history that begins at the beginning, *Rings Around the World* moves along at a rather comfortable pace until about 1900. From that point, the action speeds up, and although Gartmann devotes many pages to

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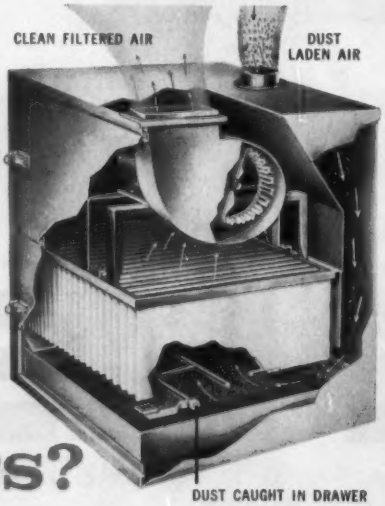

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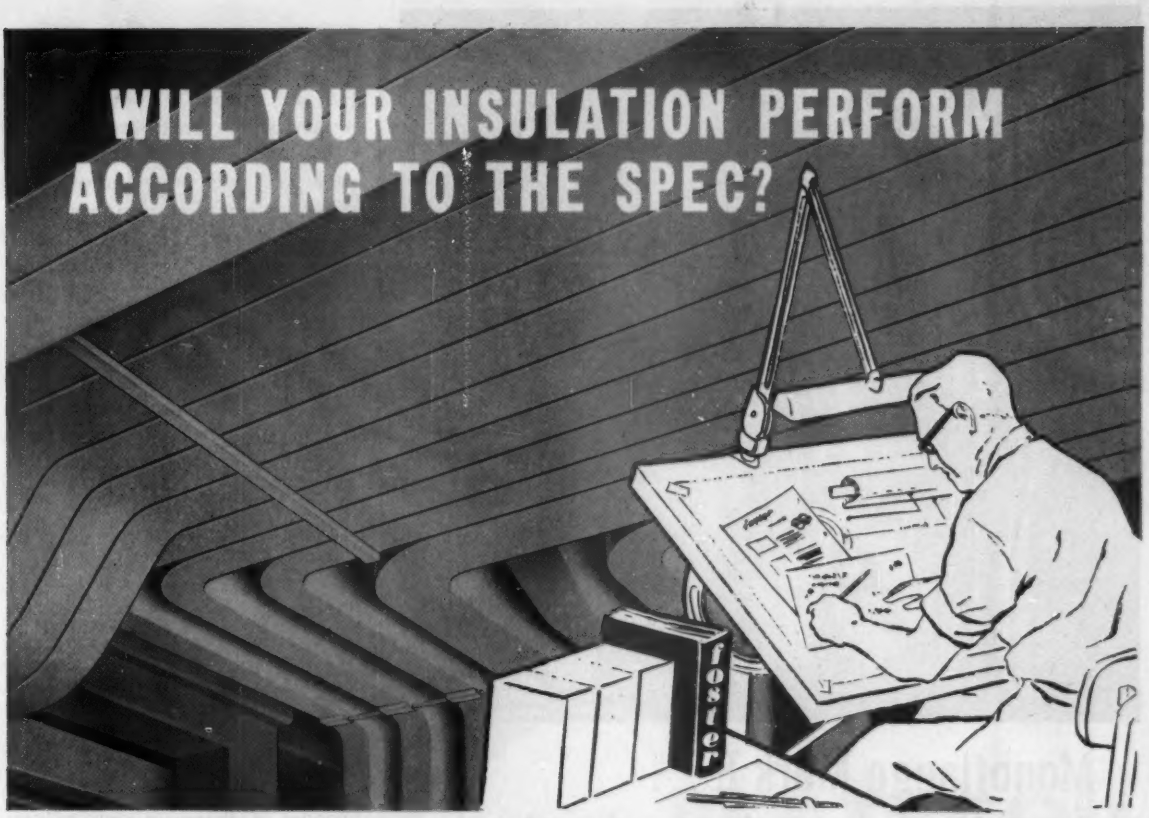

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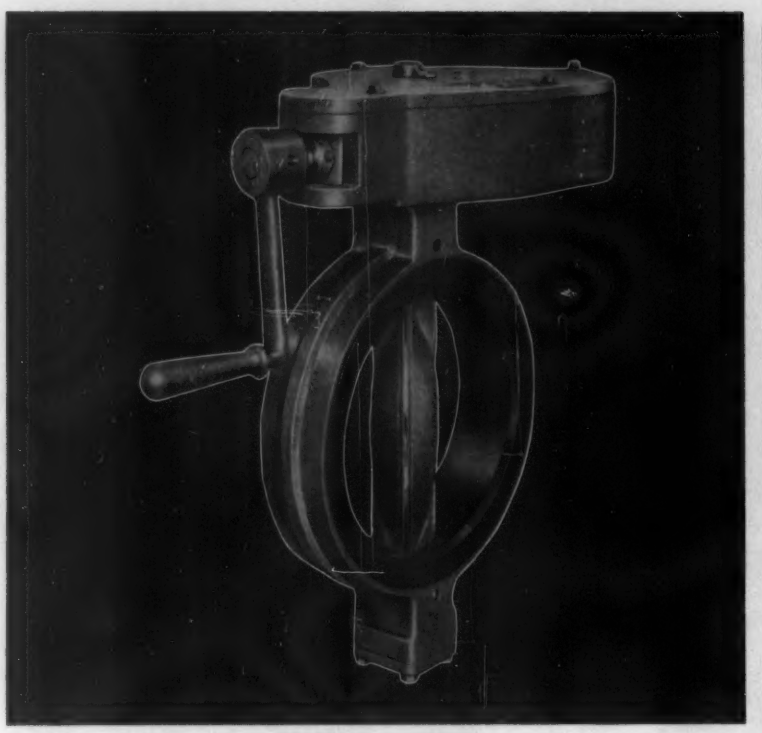

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only a few years, the reader is still a little breathless when he reaches the last section, devoted to the photon rocket controversy.

Inevitably, this history of transportation and communication is also a history of man's inherent resistance to change. It is an old story, and one would think that modern scientists would have learned something from it. But they, like the rest of us, seem still to be bound by the chains of prejudice. If it adds nothing new to technological history, we can hope that *Rings Around the World* will at least help to loosen our attitude toward change.

•

American Memoir, by John Dodds; Holt, Rinehart and Winston, New York; $4.00.

This is a collection of scripts from a series of programs produced for National Educational Television. The programs (and so the book) are one man's analysis of the changes in American mass culture over the past 60 years. The analysis, although it is brief and general, avoids being superficial.

Professor Dodds emphasizes that his interest is not in the highest intellectual achievements of an era, but rather in the attitudes, tastes, and ideals of the masses. Thus he goes about reminding us (those old enough to remember) of the externals of our culture from the turn of the century to the present day: the cars we drove, the books we read, the houses we lived in, and the heroes we worshipped.

The author includes the customary jibes at Detroit, Hollywood, and Madison Avenue, but he does not thrash out blindly. He even manages to find a few cars, movies, and ads that he likes. The chief, perhaps the only, complaint we have with *American Memoir* is Professor Dodd's uncanny knack of agreeing unerringly with our own personal prejudices and tastes. This, naturally, leads us to fear that perhaps we ourselves are not as per-

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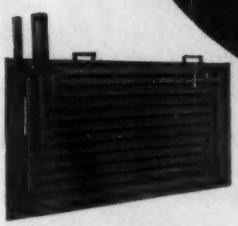
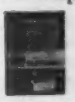


"Standard" Style 90 PLATECOIL with exclusive "MULTI-ZONE" design, for optimum steam distribution. Serpentine styles for cooling also available as standard.



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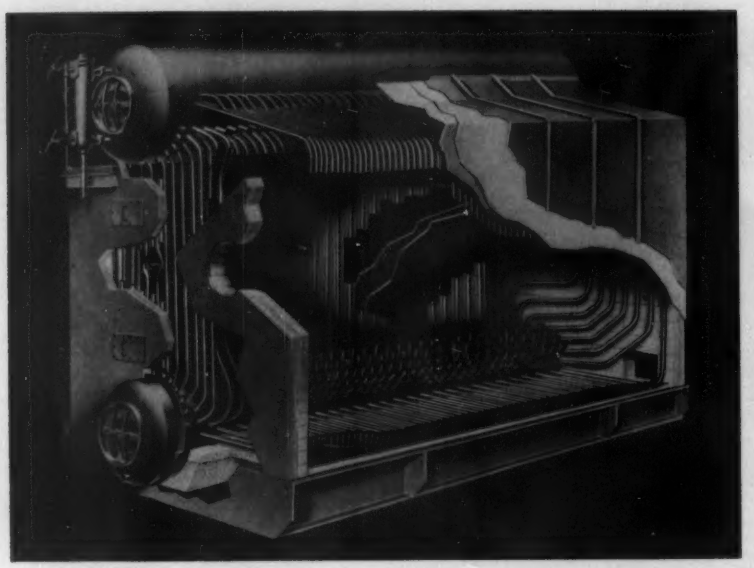
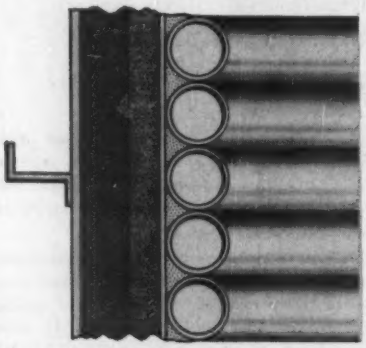


BROS boosts boiler efficiency by putting heating surfaces where they should be!

Heating efficiency in BROS Series "P" Package Boilers is exceptionally high. There are many reasons.

One is the fact that a large proportion of the heating surfaces are *inside the furnace* where heat absorption is highest. A relatively small portion is located in the convection zone.



OUTER FURNACE WALL (Above) is built of welded 10-gauge steel reinforced by Z-bars. Next are 1½" and 1" blankets of medium and high temperature insulation, then 16-gauge inner casing. Trowelled refractory between tubes provides smooth surface for inner casing.

FURNACE FLOOR TUBES are bare and not covered by refractory. Space between tubes and plate is filled with loose insulation. Radiant heat prevents condensation and corrosion of tubes.

Inside the furnace, all heating surfaces are *tubes*. These provide far more direct (and consequently more efficient) heat contact than do the extended surfaces so often found inside other furnaces.

Here are some other reasons why BROS Package Boilers will give you greatest operating economy.

- **Horizontal cross-flow of gases provides maximum and efficient heat transfer.**
- **Tangent tube furnace walls provide maximum furnace heat absorption, decrease loss by radiation. Tubes on floor, sides and roof, along with coverage of rear wall, minimize furnace refractory maintenance.**
- **Deep furnace provides long flame travel.**
- **No waterwall headers to slow the circulation or complicate cleaning. Furnace tubes are continuous from drum to drum. There are no handholes to maintain.**
- **Heavy all-welded structural steel base distributes weight over a large floor area. No special foundation is needed.**

BROS "P" Boilers are compact, self-contained, pressurized furnace units with capacities of 10,000 to 100,000 lbs. steam per hour. Standard design capacities are 200 and 250 psig but similar boilers for higher pressures and temperatures can also be supplied.

For illustrations, features, drawings, specifications and complete performance data, see your nearest BROS Representative . . . or write

POWER DIVISION

BROS *Incorporated*

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ceptive as we had imagined. It is easy to lose faith in your personal opinions when you discover that they are really quite popular.

•

The Wonderful World of Engineering, by David Jackson; Garden City Books, Garden City, N.Y.; $2.95.

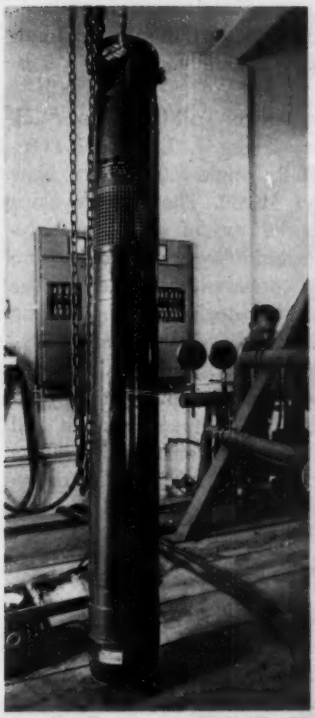
If you are determined to interest your son or grandson in a career in engineering, this book may help. However, it is only fair to point out that it was printed in Great Britain, and hence is almost totally concerned with the traditional activities of British civil engineering.

The excellent art work and photography tend to overshadow the copy, but the balance is probably just about right for the early teenage reader. Certainly, roads and bridges, dams and tunnels, harbors and canals are excellent subjects for illustration. There is also an excellent section on buildings, but it is entirely devoted to structural problems. Unfortunately, the author seems totally oblivious to the need for adequate heat, light, and plumbing – a phenomenon reported not to be uncommon in Great Britain.

•

New Technical Books

DESIGN OF MECHANICAL ELEMENTS, by R. Johnson; John Wiley & Sons, Inc., New York; $11.50. The author presents a method of optimum design which is applicable to a wide range of mechanical design problems. The design approach minimizes trial and error practices, but takes into account certain unavoidable limitations imposed upon theoretical optimum design by practical working tolerances found in manufacturing procedure. Although some form of theory is employed in the design examples, practical, if not optimal design can be attained without the use of theory. The text is well illustrated



TESTING

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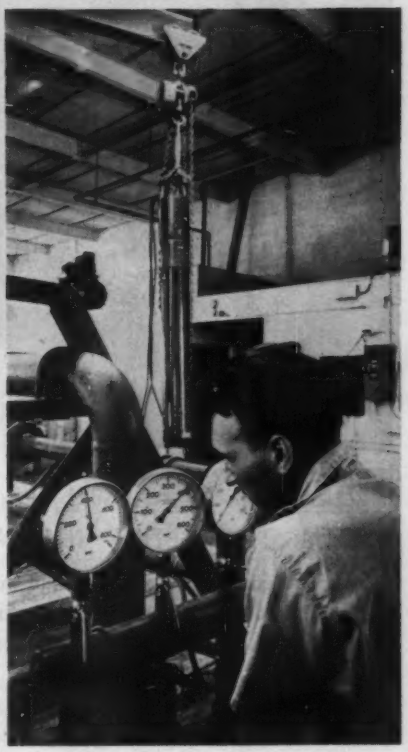

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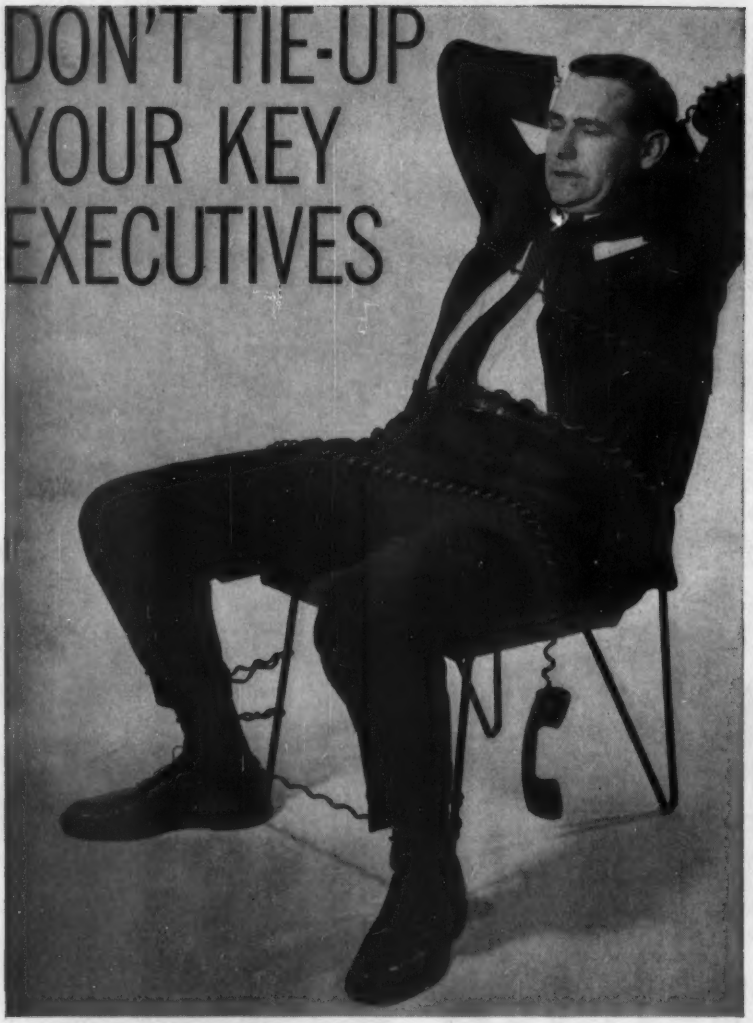

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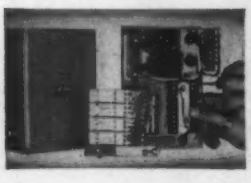

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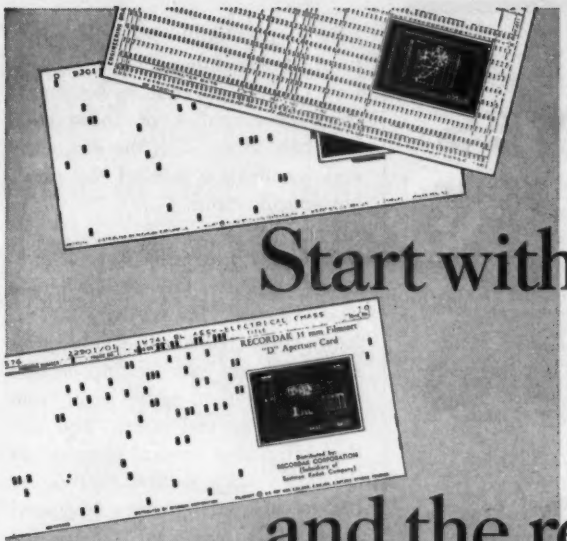
and examples are thoroughly treated mathematically.

INTRODUCTION TO MECHANICS (Vol. 1), by Irving J. Levinson; Prentice-Hall, Englewood Cliffs, New Jersey; $10.60. The text develops the basic laws of statics and dynamics inductively — grading from simple to complex. Written on the student or technical engineering level, the theories of earth rotation, the Cariolis acceleration, shear and moment design, friction, fluid statics, elastic impact, balance, and vibration are described without the use of calculus. Clear line drawings and easy-to-follow mathematical progression make this book interesting and informative.

FLOW OF FLUIDS THROUGH POROUS MATERIALS, by R. Collins; Reinhold Corp., New York; $12.50. Claimed to be the first unified treatment of all aspects of all types of flow, this book develops logical and concise theories of types of flow using advanced mathematical concepts. Primarily a petroleum engineer's reference, it also should interest chemical, civil, and soil engineers.

PATENT MANUAL FOR SCIENTISTS AND ENGINEERS, by G. Naimark; C. Thomas, Publisher, Springfield, Ill.; $5.50. Intended to educate engineers and scientists in the complicated field of patents, this book suggests what the engineer must do to protect himself and his client where patents are involved. It also discusses "trade secrets" and confidential information as they relate to the consulting engineer. This small book is a highly recommended working guide to those engineers engaged in industrial, chemical, process, or mechanical engineering.

LIGHT GAGE COLD-FORMED STEEL DESIGN, 1961 Edition, The American Iron and Steel Institute, New York, New York; $1.00 COMMENTARY; $0.50. This is the third edition of this design manual which sets the standards of engineering use of



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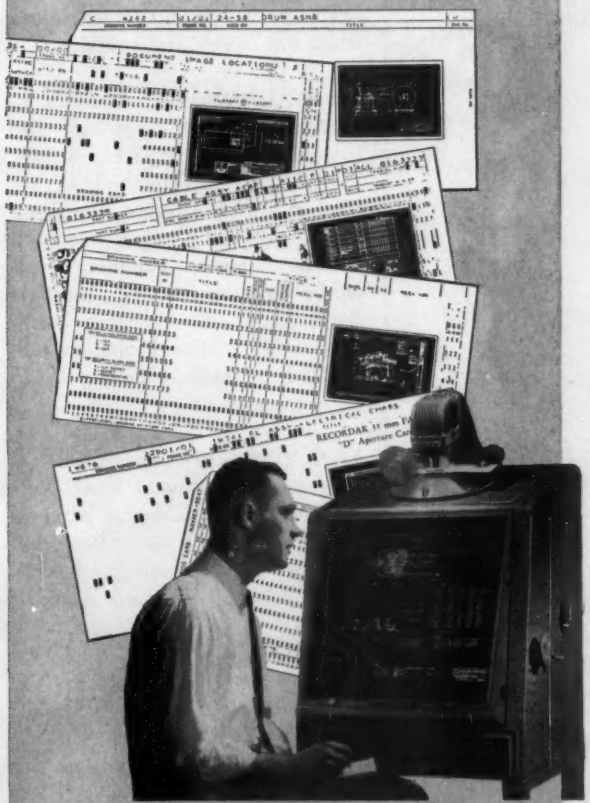

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Fig. 425 conforms to Federal Specification WW-V-54, Type II, Class A. These valves can be repacked under pressure, thus eliminating line shut-downs. Simply open valve fully, remove packing nut and repack.

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Fig. 425

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light gage cold formed structural steel members. The commentary briefly and concisely presents the characteristics of these steel members along with the reasoning and justification behind the product specifications.

STATICALLY INDETERMINATE STRUCTURAL ANALYSIS, by R. L. Sanks; The Ronald Press, New York, New York; $10.00. The subject of structural analysis is approached from the method rather than from the problem viewpoint. The author often uses several chapters to develop a single method thoroughly before introducing more advanced methods. Although written for the undergraduate student, the book is meaty enough for the practicing engineer who wants to brush up on structural theory and practice.

TENSOR ANALYSIS OF ELECTRIC CIRCUITS, by L. V. Bewley; The Ronald Press, New York; $12.00. The matrix-tensor methods of analyzing electric circuits, developed by Gabriel Kron, are consolidated in this volume. "Primitive" networks and machines and simplified development of equations correlated with a "transformation tensor" aid the designer in simplifying his computations.

MINE VENTILATION, by Howard L. Hartman; The Ronald Press, New York; $12.00. The author expands the three broad areas of air conditioning – quality control, quantity control, temperature and humidity control – from the viewpoint of total mine atmosphere. Important for the consulting engineer, the economics involved in design are given thorough treatment, and case histories from design through operation are studied. Subjects are developed independently; the reader can follow easily without excessive cross-referencing.

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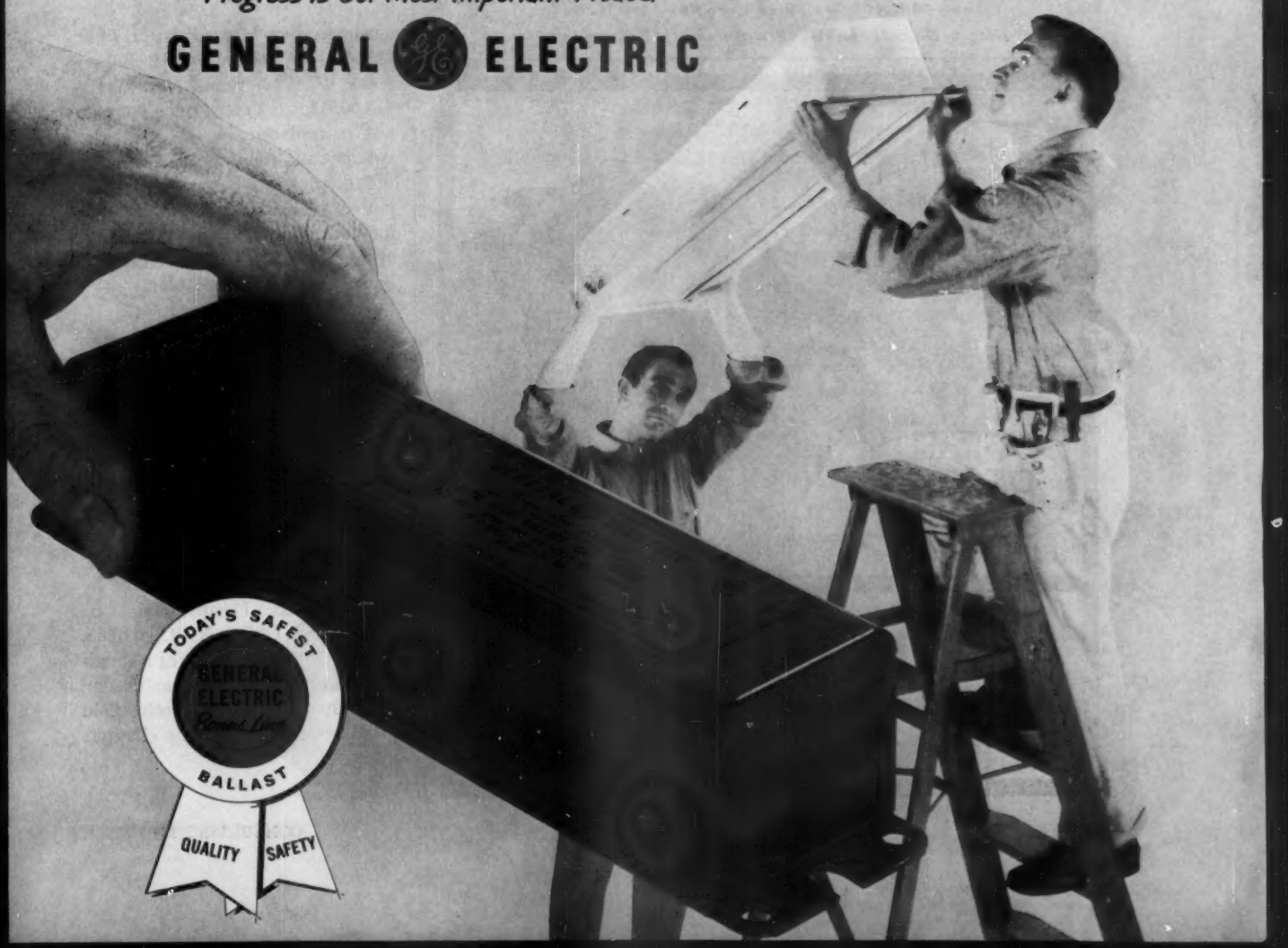

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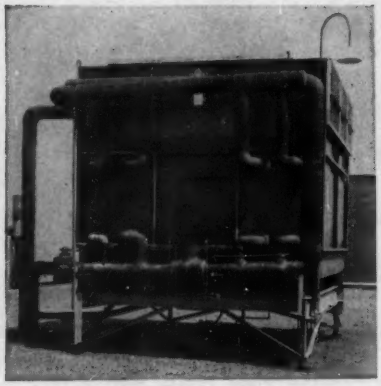

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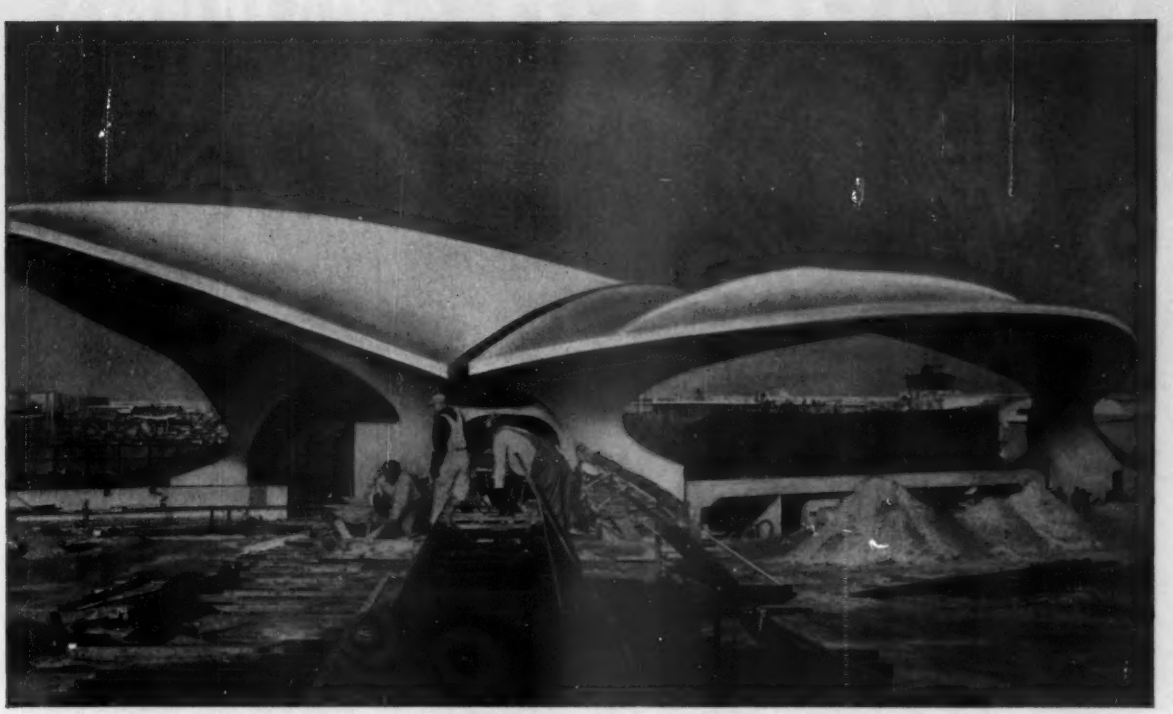
York; $8.00. For the first time, this study, by the Union Carbide company and West Virginia University, has been made available to the public. It presents tables, formulas, and methods for specifying the insulation needed for various conditions on flat surfaces and on pipes at elevated temperatures.

ENGINEERING MANAGEMENT AND ADMINISTRATION, by Val Cronstedt; McGraw-Hill Book Company, New York; $8.50. This book, by a consulting engineer, is essentially a reference book describing the operation of an engineering department in an industrial plant. As the title implies, the author concerns himself with the administrative problems rather than the technical ones. One of his most strongly stressed points is that there should be a separation of technical and administrative duties; particularly, all administrative duties should be removed from technical personnel.

TEMPERATURE MEASUREMENT (Vol II), by H. D. and N. H. Baker; John Wiley & Sons, New York; $13.00. This is a companion volume, not a replacement, for the first volume, published in 1953. Volume II is divided into two parts: the first part is a discussion of the different methods and techniques of temperature measurement; the second part offers treatment of problems.

ELECTRIC UTILITIES COSTS, by William Iulo; Washington State University Press, Pullman, Washington; $7.50. This statistical analysis shows the relationships between unit electrical costs and operating, market, and historical factors. The information is based on a six-year study of 186 electric utilities.

DESIGN OF MACHINE ELEMENTS, by M. F. Spotts; Prentice-Hall Co., Englewood Cliffs, N. J.; $13.35. This is the latest edition of a standard text-book in machine design. The author covers the entire field in an arbitrary order; the chapters



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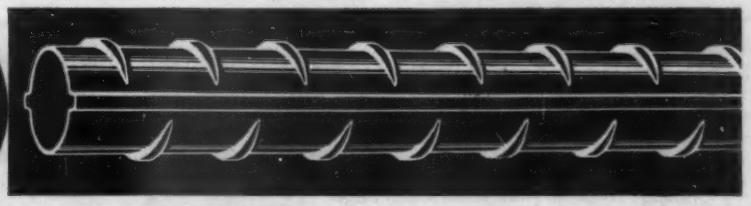


7-61

A portion of the Fitchburg Paper Company plant in Fitchburg, Massachusetts. The handsome new building in the foreground houses the Hardinge Filtration Plant.

Clean Water . . .
FOR FITCHBURG PAPERS

The Fitchburg Paper Company of Fitchburg, Massachusetts, is a producer of high-quality specialty and technical papers for a widely diversified market. Fitchburg products include photographic papers, reproduction papers, gift-wrapping papers, transparentized sheets for business forms, and many other highly specialized, quality papers.

An important ingredient in paper manufacturing is an abundant supply of good process water. The manufacture of Fitchburg's high quality papers demands an exceptionally clean, pure water. To improve their product quality to meet the exacting demands of their various customers, Fitchburg Paper Company, in 1957, added to their facilities a completely new process-water filtration plant, in which the key equipment is a Hardinge Automatic Backwash Sand Filter.

Raw water is drawn from a nearby river, passes through a sedimentation reservoir, and enters the new water filtration plant.

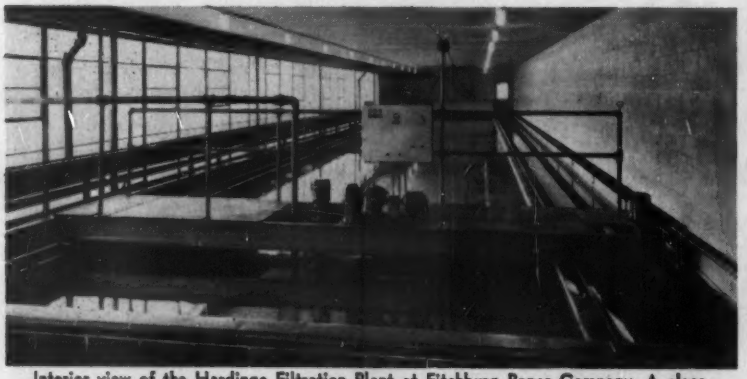
The Hardinge filter tank measures 16 feet in width by 110 feet in length. The filter bed is separated by vertical stainless steel spacers into 165 compartments running across the 16' width of the filter bed, each with its own sand bed and underdrain, and individual opening to the filtered water channel.

The sand in each of these compartments is cleaned periodically by a moving backwash carriage which reverses the flow in the compartment over which it is operating, backwashing one compartment at a time with filtered water, while the rest of the filter bed operates in the normal manner. Filtration is continuous, with no shut-down necessary for backwashing.

Operation of the backwash carriage is controlled automatically either by water-level operated switches, or by a timing device.

The filtered water drops to a clear well directly beneath the filter, and from this point is pumped, as needed, to the various paper making processes.

The Hardinge filter at Fitchburg has been in operation for nearly four years, and is currently providing approximately 5 million gallons per day of process water which satisfactorily meets the Fitchburg paper quality requirements.



Interior view of the Hardinge Filtration Plant at Fitchburg Paper Company. A clear-well is located directly under this 5,000,000 gallon per day filter.

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could be read in any sequence. Emphasis is on the correct design of each element of a machine rather than on the entire machine.

COMPUTER PROGRAMMING, by H. D. Leeds and G. M. Weinberg; McGraw-Hill Co., New York; $8.50. This complete introduction to the general field of computer techniques is written for the layman who has only a cursory knowledge of the mathematics and scientific principles involved. The book covers everything from an explanation of what computers are to the details of their application, although the stress is on programming process.

PROGRESS IN HIGH PRESSURE RESEARCH, by F. P. Bundy; John Wiley & Sons, New York; $12.00. This book consists of the papers and discussions presented at a conference on high pressure research last year. Most of the papers presented were of a highly technical nature, and would be of limited interest to the consultant.

STRUCTURAL ENGINEERING FOR PE EXAMINATIONS (1st edition), by Max Kurtz; McGraw-Hill Book Company, Inc., New York; $9.00. Designed to help any professional engineering candidate pass state examinations, the book discusses a wide range of subjects from simple mechanics through municipal civil engineering work. Time saving features in computing and checking problems are stressed, and an appendix lists subjects often encountered in exams.

MARINAS, RECOMMENDATIONS FOR DESIGN, CONSTRUCTION, AND MAINTENANCE, by Charles A. Chaney; National Association of Engine and Boat Manufacturers, Inc., New York City; $8.75. Written by a consulting engineer, this unusual and interesting book is edited for those contemplating construction of marina facilities for pleasure craft, and for boating buffs. This edition, the latest of four books by the au-

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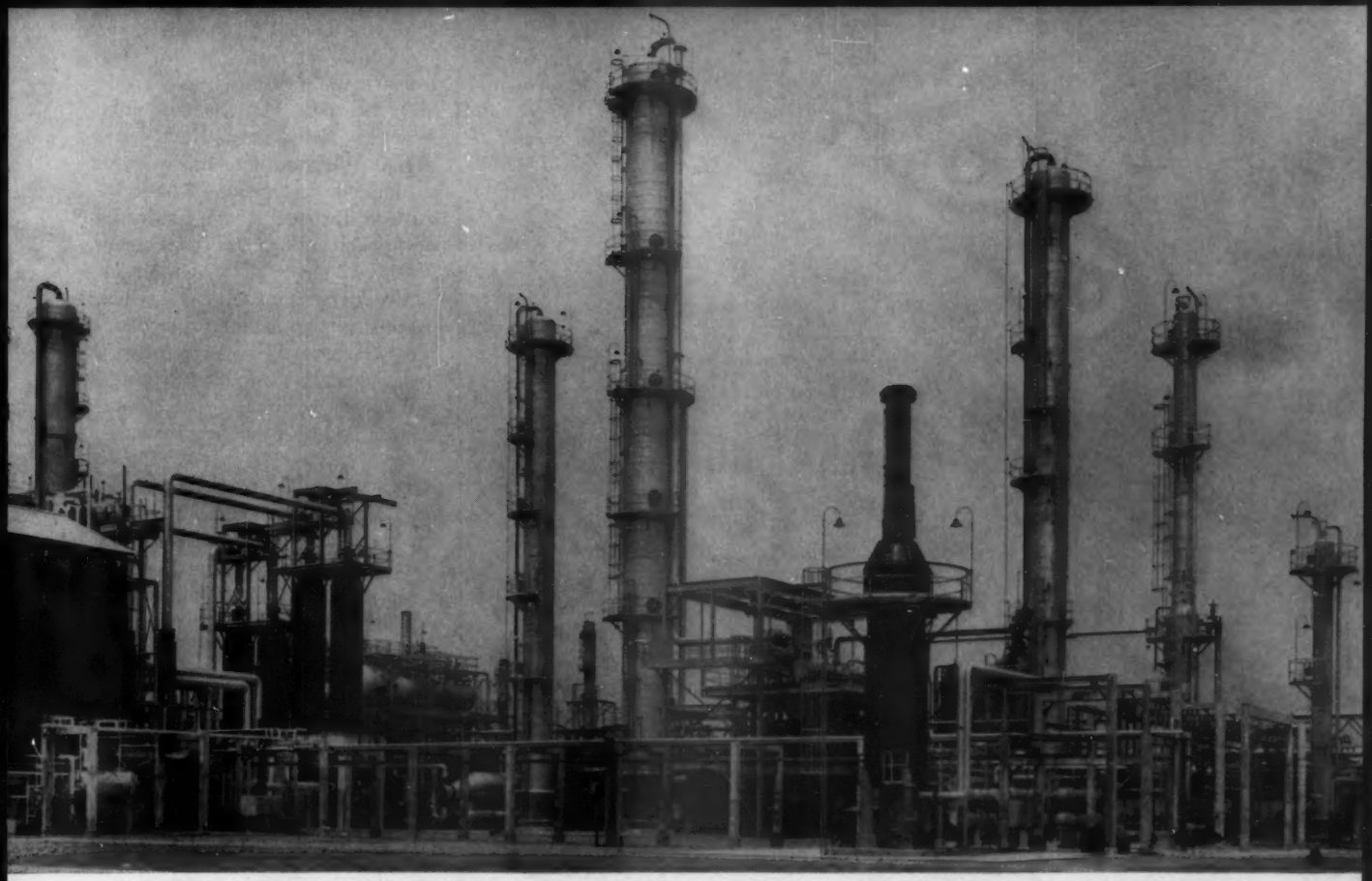

View of 16,000 BPSD PLATFORMING® unit at the Houston, Texas, Refinery of SHELL OIL COMPANY, licensed by UNIVERSAL OIL PRODUCTS COMPANY and designed in conjunction with Shell.

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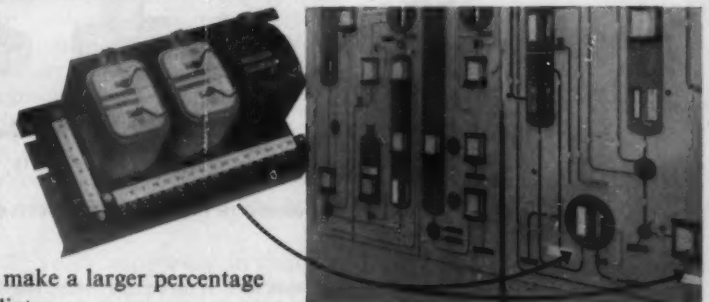

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This is not only a trademark, but a mark of certification. It not only identifies these as products of Tube Turns Plastics, but certifies that each meet the specifications as marked on each fitting, flange and valve. All are fully identified, providing material grade, size and quality control number. All numbers are on file giving complete history, including type and source of material, tests made on it, production data and date.

You can be sure that products so fully identified have been produced with utmost care and assure top performance. When you require plastic piping, specify ttp. Your nearby ttp distributor is ready to serve you promptly. For further information, write for Bulletin TTP-219-K153.

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30th and Magazine Street • Louisville 11, Kentucky

MARK OF PROGRESS IN INDUSTRIAL PLASTICS PIPING

- **UPVC** fittings, flanges and valves for strong, corrosion resistant piping and drainage systems. Will handle most fluids and gases up to 150°F.
- **"PENTON"** (chlorinated polyether) piping, fittings, flanges and valves for handling hot, corrosive fluids and gases up to 250°F.
- **POLYETHYLENE** and **POLYPROPYLENE** drainage fittings for cost-cutting, corrosive resistant industrial and laboratory waste disposal piping systems.
- **UPVC** and **"PENTON"** lined metal pipe, fittings, flanges and valves for corrosion resistant piping with greater structural strength. Will handle fluids and gases at higher temperatures and pressures.
- **NEW PLASTIC** materials, both thermosetting and thermoplastic, formed into pipe, fittings, flanges and valves to better meet the requirements of today and the needs of tomorrow. Data available.

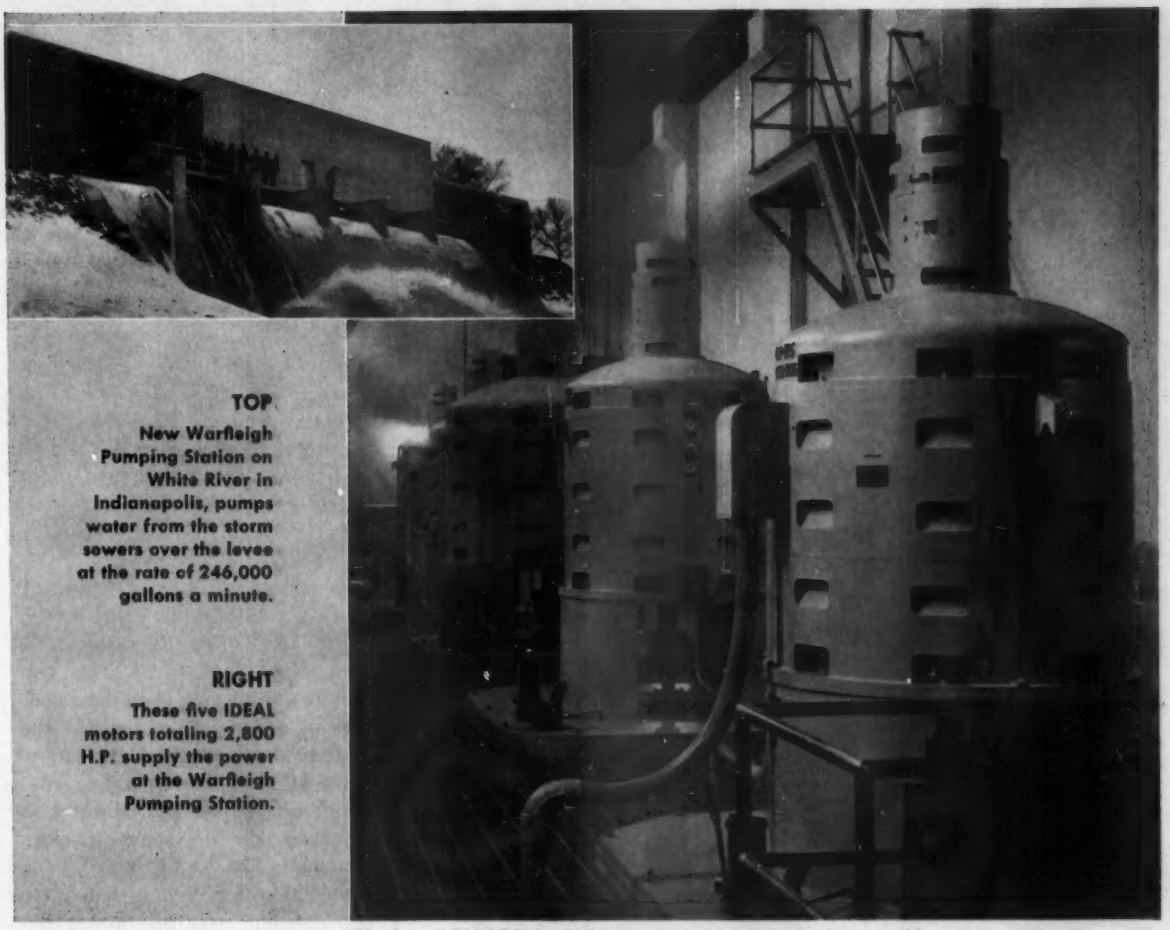
thor, brings in the newest materials and construction methods leavened with experience gained from 25 years of marina design. Serious students of small craft harbor design will benefit from this book.

INDUSTRIAL FURNACES, by W. Trinks and M. H. Mawhinney; John Wiley & Sons, Inc., New York; $17.00. This edition incorporates a complete description of basic industrial furnace design with the newest changes in furnace technology. Changes in this edition include a reorganized text which conforms with actual furnace design, a separate chapter on theory and calculation of heat transfer, and deeper treatment of forced convection and axial heating furnaces.

FLUORESCENT LIGHTING MATERIAL, (3rd Edition), by Charles Amick; McGraw-Hill, New York; $12.50. This second revision of the first commercial guide to fluorescent lighting includes material on new, extra-high output lamps, and details of installing recessed equipment for the different classifications of suspended ceilings. The regular sections on design, specification, installation, and maintenance of fluorescent lighting have been brought up to date.

ESSENTIALS OF DIELECTROMAGNETIC ENGINEERING, by H. M. Schlicke; Wiley & Sons, Inc., New York; $9.50. This book is intended as a reference or advanced text on the use of ferrites and high permittivity dielectrics. The author presents his material as intellectual stimulation as well as factual knowledge. In each section, and in an appendix, he presents questions and topics for consideration, not all of which are answered.

CONTROL OF NUCLEAR REACTORS AND POWER PLANTS (Second edition), by M. A. Schultz; McGraw-Hill, New York; $12.50. The first edition of this book assumed that Uranium 235 was the only practical



TOP
New Warfleigh Pumping Station on White River in Indianapolis, pumps water from the storm sewers over the levee at the rate of 246,000 gallons a minute.

RIGHT
These five IDEAL motors totaling 2,800 H.P. supply the power at the Warfleigh Pumping Station.

The firm of MOORE & HEGER was the Consulting Engineer on this project.

control a flood . . . or water a city with IDEAL MOTORS

Five IDEAL Motors, 2—400 H.P., 2—600 H.P. and 1—800 H.P., supply the power to control flood water at the Indianapolis Warfleigh Pumping Station. These slow speed Vertical Solid Shaft Synchronous motors power pumps that have a capacity of 246,000 gallons of water per minute, (enough water to fill a 35′ x 75′ x 12½′ deep swimming pool in one minute).

Whether it is power to control a flood or supply water for a large municipality or commercial use . . . whether 10 or 10,000 H.P. is needed, Ideal Electric can furnish the exact motor for any pumping requirement.

IDEAL'S more than 50 years' experience in engineering and manufacturing electric motors, generators and controls results in IDEAL PERFORMANCE on any job.

Write for Ideal's newest booklet, "Ideal Powers Pumps For The Motor City."

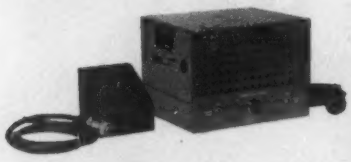
The IDEAL ELECTRIC AND MANUFACTURING COMPANY
610 East First Street Mansfield 1, Ohio
MOTORS, GENERATORS AND CONTROLS TO 10,000 H.P.

Protective Coating Inspection Problems?

Here's Your Answer

No matter whether you're coating a pipeline or a chemical tank, continuity is vital. Use of a Tinker and Rasor Holiday Detector while the job is open, can save days of downtime later on.

• PLANT AND YARDS

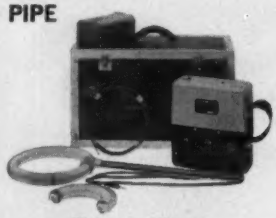


Tinker and Rasor
EPAC Holiday Detector or J-1ACM

EPAC operates off 110 volts A.C. power for stationary coating operations. Internal voltage adjustment from 5,000 to 20,000 volts or with external variable transformer from 500 to 6,000 volts, or 5 KV to 20 KV.

J-1ACM for continuous inspection on coating and wrapping machines which use water for cooling.

• PIPE



Tinker and Rasor
E-P or E-4 Holiday Detectors

Output adjustable from 5,000 to 20,000 pulsating volt..ge.

E-P—All purpose for larger diameter pipe, damp or dry climate, pre-fab film or hot applied coatings.

E-4—Lower cost, dry surface type of detector specifically designed for smaller diameter pipe and flat surfaces.

• THIN FILM

Tinker and Rasor
M-1 Holiday Detector

For painted or sprayed thin film coatings such as vinyls and epoxies. Maximum applied voltage 67½ V., non-destructive to coatings. Belt mounted, 4-lbs. total weight.

• UNDERGROUND

Tinker and Rasor
Pearson-type Holiday Detector

For detecting holidays and electrical shorts without uncovering the pipeline. Completely transistorized . . . generates 15 watt, 750 cycle, stable A.C. Audio-frequency signal. Adaptable to null search method.

Tinker and Rasor has prepared a complete data kit which describes the null search system as well as other recommended procedures for inspecting protective coatings. Material includes technical data on equipment, general discussion of types of detectors, theory of operations, etc.

Engineering Note:
To insure a perfect application, include Tinker and Rasor Holiday Inspection. Write for specification guide.

Quality Control for Coating Application

TINKER & RASOR

417 Agostino Road, P.O. Box 281 • San Gabriel, California

fuel for nuclear reactors. The developing use of Uranium 238, Thorium, and combinations of fissionable materials made this second edition necessary. The author has included the new fuels, as well as other technological advancements.

PROGRESS IN DIELECTRICS, Volume 3, by J. B. Birks and John Hart; John Wiley & Sons, Inc., New York; $10.00. This book contains 6 sections, each written by leading experts in the field of dielectrics. The topics covered are microwave applications of dielectrics for aerials and waveguides, weak field properties of dielectric materials, and dielectric breakdown of solids.

MANAGEMENT CONTROL SYSTEMS, by D. G. Malcolm, A. J. Rowe, and L. F. McConnell; John Wiley & Sons, New York; $7.25. This volume is a transcript of the proceedings of a symposium held at the System Development Corporation, Santa Monica, California. In recognition of the fact that the design of management systems is more systematic than analytical, the problems of designing adequate management controls are given careful consideration.

WATER SUPPLY AND WASTE DISPOSAL, by W. A. Hardenbergh and E. A. Rodie; International Textbook Company, Scranton, Pennsylvania. This basic book contains a well integrated presentation of the theory and practice of water purification and sewage treatment. Organized to avoid duplication of subject matter, detailed consideration is given the design and operation of purification and waste treatment plants for domestic and industrial applications.

PILE FOUNDATIONS, by Robert Chellis (second edition); McGraw-Hill Book Company, New York City; $16.00. All phases of the theory, design, installation, maintenance, and repair of pile foundations are covered in this book by Robert

. . . find ready utilization in ambitious Detroit urban-renewal project!

Design for Living, City-Style—Mies van der Rohe's Lafayette Park Development in downtown Detroit. Mahon Long-Span M-Deck was used as the roof system in all 22 low-rise building units. Contractor: Herbert Construction Co., Chicago

Architects and engineers know Mahon Long-Span M-Decks as a valuable ally in curbing construction costs without sacrificing design expression. M-Decks are proven, multi-purpose roof sections that can be functionally used in a variety of ways—even as a *combined structural roof deck and ceiling system.* Why not find out how space-spanning (truss-to-truss) M-Deck can help you . . . your projects . . . your costs? Call in your local Mahon architectural representative or write for the new catalog LSD-61.

MAHON LONG-SPAN M-DECK SECTIONS
Standard M-Deck types now in manufacture by Mahon. Special-form sections can also be supplied.
SECTION M1-OB
SECTION M1-OB
SECTION M2SR

MAHON BUILDING PRODUCTS

- Aluminum or Steel Curtain Walls (in natural or colored metals)
- Rolling Steel Doors (Standard or Underwriters' labeled)
- Metalclad Fire Walls (Underwriters' rated)
- M-Floors (Steel Cellular Sub-Floors)
- Long Span M-Deck (Cellular or Open Beam)
- Steel Roof Deck
- Acoustical and Troffer Forms
- Acoustical Metal Walls, Partitions and Roof Decks
- Permanent Concrete Floor Forms

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- Structural Steel-Fabrication and Erection
- Steel Fabrication-Weldments
- Geodesic Domes—Fabrication and Erection

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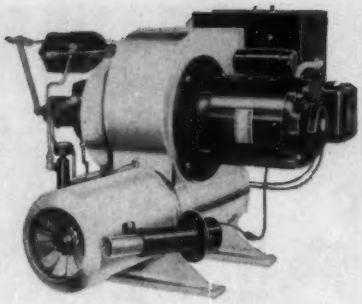
SPEEDING AMERICAN CONSTRUCTION WITH METAL BUILDING PRODUCTS, FABRICATED EQUIPMENT AND ERECTION SERVICES

MAHON

INDUSTRIAL COMBUSTION



HEV-E-OIL BURNER
saves fuel & operating costs

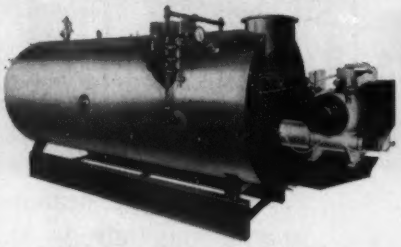
Especially engineered to make use of inexpensive No. 4, 5 and 6 heavy oils. Only burner to apply successfully the principle of low pressure air atomization of heavy fuel oils *inside the burner nozzle*. Eliminates costly maintenance.

Write Dept. B-101 for nation-wide listing of HEV-E-OIL Burner installations.

- Ready to install — factory assembled — completely wired.
- All combustion air is furnished by the burner.
- Simple installation saves money.
- Factory trained service men available throughout the country.

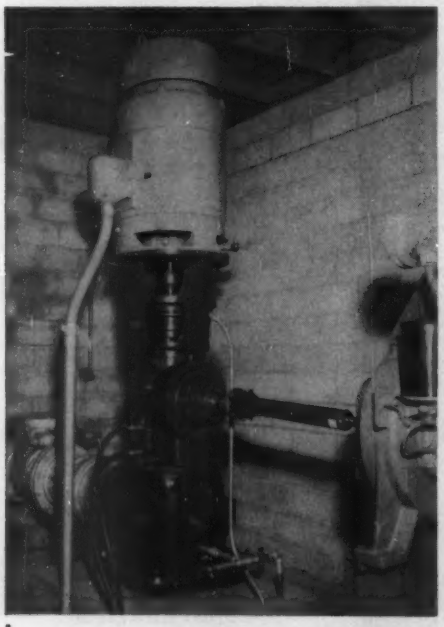
HIGHLANDER AUTOMATIC BOILER-BURNER
low or high pressure steam or hot water

You can rely on this HIGHLANDER for *all* heating or power applications. Choice of burners for heavy oil, light oil or combinations of gas/light or gas/heavy oils.



- Easy maintenance of boiler and burner.
- Burner fire tested at factory.
- Entire unit Underwriters Laboratory Approved — Certified rating for output.

INDUSTRIAL COMBUSTION INC.
Executive Offices:
4447 N. Oakland Ave., Milwaukee 11, Wis.



NEW! Automatic combination gear drive

JOHNSON
Redi-Torq®

Redi-Torq combination right angle gear drive with automatic clutch, eliminates manual switch-over to engine drive in case of power failure. Drive couples to engine by flexible shafting or couplings—engine clutch unnecessary. Engine may be tested without interfering with electric motor operation of pump.

For round-the-clock protection against power failure in water, sewage and fire installations. Developed and proven in municipal and industrial use over several years.

Sizes: 15 to 200 hp; hollow or solid shafts. Write for engineering catalogs.

JOHNSON • MAKERS OF FINE GEARS SINCE 1904
GEAR & MANUFACTURING CO., LTD.
8TH AND PARKER STREETS • BERKELEY 10, CALIFORNIA

East and Gulf Coast representatives:
Smith Meeker Engineering Co., 157 Chambers St., New York City

13-R

Chellis, a structural engineer with Stone & Webster Engineering Corporation. The author describes and evaluates different kinds of piles and their use, and devotes much attention to the problems of soil mechanics and analysis.

PRESTRESSED CONCRETE — DESIGN AND CONSTRUCTION, by James Libby; The Ronald Press Company, New York City; $12.50. Consulting engineer Libby divides his treatment of the theoretical and practical aspects of prestressed concrete into three sections: the first part of the book presents the basic principles of flexure analysis; the second part applies flexure analysis to the design of structural members; and the last part discusses the practical considerations of prestressed concrete.

HANDBOOK OF INSTRUMENTATION AND CONTROLS, by Howard Kallen; McGraw-Hill Book Co., New York City; $15.00. The sub-title of this book explains quite fully what it is all about: *A practical Manual for the mechanical services covering Steam Plants, Power Plants, Heating Systems, Air Conditioning Systems, Ventilation Systems, Diesel Plants, Refrigeration, and Water Treatment.*

HANDBOOK OF MECHANICAL WEAR, edited by Charles Lipson and L. V. Colwell; The University of Michigan Press, Ann Arbor, Michigan; $20.00. This is a collection of scientific papers, all examining the different processes and factors which result in machine wear. The papers are broken down into six categories: fundamental aspects of wear; pitting, scoring, and spalling; corrosion; abrasion; wear resistance materials; and manufacturing processes.

ASPHALT: ITS COMPOSITION, PROPERTIES AND USES, by Ralph Traxler; Reinhold Publishing Corp., New York City; $10.00. A description and explanation of the chemical,

Take the sURGE

out of mercury-lamp starting

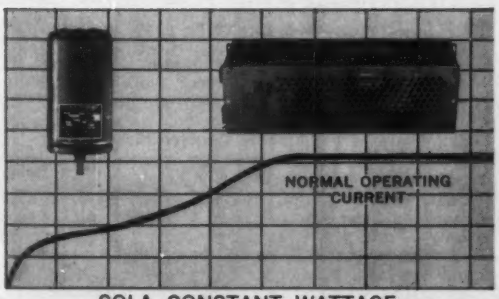
WITH SOLA CONSTANT-WATTAGE BALLASTS

Full rated lamp life . . . more lamps per circuit . . . less costly wiring: These across-the-board SOLA savings reduce installation costs, assure longer lamp life expectancy and less maintenance. And all are direct results of SOLA constant-wattage mercury-lamp ballast design!

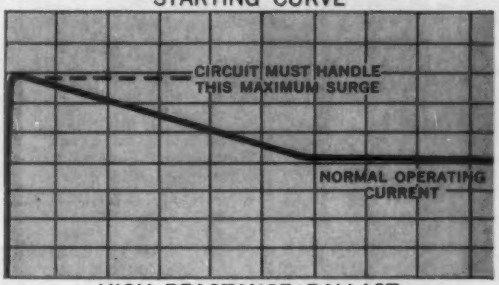
Self-limiting action of constant wattage ballasts takes power-surges out of lamp starting, automatically compensates for line fluctuations. Parallel 2-lamp models operate lamps independently of each other and keep good lamp shining steadily even after mate burns out. Complete range of types for indoor as well as outdoor applications.

SOLA *constant-wattage* holds lumen output within ±1% for line-voltage changes as great as ±13%. "Drop-out" is virtually nil, since input voltage must fall *30% below nominal* before lamp extinguishes. SOLA M-L ballasts are also inherently self-protecting against open and shorted lamps.

Available for 115, 208, 230, 277, 460 and 575-volt input. Get full details from your SOLA supplier, or write us for information, specifying M-L indoor or outdoor type ballast.



SOLA CONSTANT WATTAGE STARTING CURVE



HIGH-REACTANCE BALLAST STARTING CURVE

SOLA

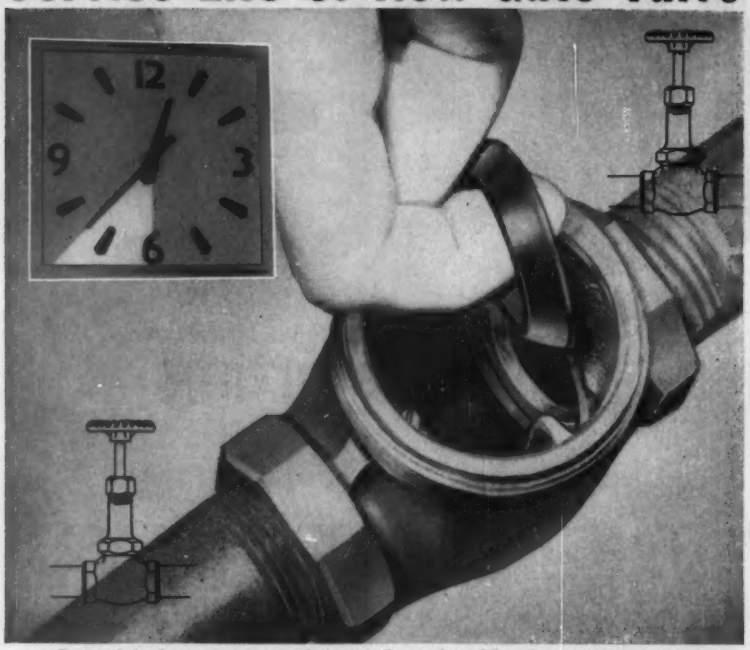
A DIVISION OF BPC

SOLA ELECTRIC CO.
1717 Busse Road
Elk Grove Village, Ill.
HEmpstead 9-2800
IN CANADA, Sola-Basic Products Ltd., 377 Evans Ave., Toronto 18, Ontario

BASIC PRODUCTS CORPORATION

S-34-61

Only 7 to 10 Minutes to Renew Service Life of New Gate Valve



Patented development assures replacement of seat ring while valve remains installed.

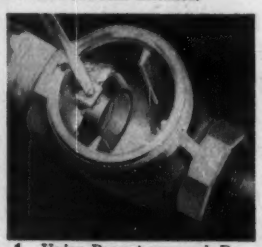
Without removing the valve body from the line, you replace the nickel-alloy seat rings in Fairbanks new patented Renewable Seat Ring Gate Valves. In 7 to 10 minutes, from the time the line is shut down until it is put back into operation, you have given a new service life, a new life of dependable tight closure to your valve.

Just 7 to 10 minutes of your maintenance man's time — only 7 to 10 minutes of "down-time" on your steam, water or process piping lines — and you have the equivalent of a new valve in the line. Think of the savings: where once at least one hour, under the most ideal conditions, was required to replace a gate valve in the line, the job is now accomplished in from 7 to 10 minutes.

Field tested for over two years, under all conditions from steam to corrosive liquids, the revolutionary new Fairbanks Renewable Seat Ring Bronze Gate Valve has proven completely satisfactory — absolutely dependable.

Made with either rising stem or non-rising stem construction in ½",¾",1",1¼",1½" and 2" sizes, the Fairbanks Renewable Seat Ring Bronze Gate Valves are recommended for severe service conditions on 200 lb. steam pressure at 550 degrees F., 400 lb. water, oil or gas pressure — non-shock — lines requiring full flow and subject to frequent operation. Nickel alloy seat rings and wedge make the valves particularly tough and corrosion resistant.

YOURS ON REQUEST: Illustrated, descriptive folder gives complete information on Fairbanks Renewable Seat Ring Gate Valve with details and specifications. Yours without charge. Write today.



1. Union Bonnet removed. Retaining screw loosened with ordinary screwdriver.

2. Finger hooks inside nickel alloy seat ring. Seat ring lifts out of valve body.

3. New seat ring is inserted. Retaining screw tightened. Bonnet replaced.

THE **Fairbanks** COMPANY
393 Lafayette Street, New York 3, N. Y.
Branches:
New York 3 • Boston 10 • Pittsburgh 22 • Rome, Ga.
Valves • Trucks • Casters • Wheels • Dart & "PIC" Unions

physical, colloidal, and rheological properties of asphalt takes up the first half of this book; the remainder covers the manufacture and use of asphalt. The text is well written, but might have been a little better illustrated.

PRACTICAL DESIGN OF STRUCTURAL MEMBERS, (Second edition), by Thomas Lucy; F. W. Dodge Corporation, New York City; $12.00. This is a reprinting of the standard text by the late T. A. Lucy. The book deals primarily with the requirements of stress analysis, emphasizing the practical aspect rather than mathematical solutions.

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To buy books reviewed here, or any other books, technical or general, fiction or fact, give us title and author, and your check if you know the price . . . or we will bill you.

Book Editor
CONSULTING ENGINEER
Saint Joseph, Michigan

MANUFACTURING PROCESSES AND MATERIALS FOR ENGINEERS, by Lawrence Doyle and others; Prentice-Hall, Inc., Englewood Cliffs, New Jersey; $15.00. The several authors and contributors lean heavily on the application of scientific and economic principles to solve complex manufacturing problems.

ENGINEERING-TECHNICAL DRAFTING AND GRAPHICS, by Giachino and Beukema; American Technical Society, Chicago; $9.75. Either drafting textbooks are getting better, or else we remember only the unpleasant parts of Engineering 0102. At any rate, this is a well-written and well-illustrated text; it also is the most recent in the field, so it probably is the most up-to-date regarding current practices. ▲▲

where **POWER** is **VITAL**

Hospitals rely on ASCO Automatic Transfer Switches

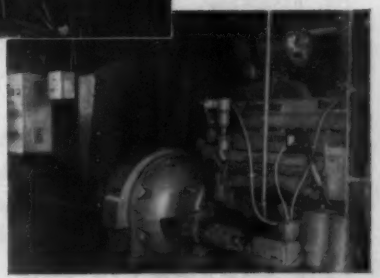
Here in the operating room, adequate lighting is as vital as the steady knife of the surgeon. *Throughout* the hospital, the functioning of life-sustaining equipment is dependent upon a continuous supply of adequate power. That is why automatic transfer switches by ASCO have been widely specified. When normal power fails they *automatically* transfer the load to an alternate source.

Dependable Control by ASCO

Where power and dependability are vital, ASCO switches give these signal design advantages: • **continuous duty rating** in either normal or emergency position • **capacity** to withstand inrush currents 20 times full load rating • **mechanical locking** providing high contact pressure • **single coil design** • **built-in time delay,** so that equipment ignores harmless momentary outages • **full-phase protection,** and other design features.

Write for Booklet 596 describing how to select an adequate automatic transfer switch. Or write in *on company letterhead* specifying Catalog 57-S1 covering complete line of ASCO transfer switches.

Typical installation: Valley Children's Hospital, Fresno, California. Comments Chief Hospital Engineer, Mr. C. G. Level: "It is a good feeling to know we have good dependable around-the-clock emergency power. I think we have the best unit to be had."



ASCO Bulletin 906 Automatic Transfer Switch at the Valley Children's Hospital; a Caterpillar D337 Diesel Electric Set is used as standby in case of commercial power failure.

ASCO

ASCO Electromagnetic Control

Automatic Switch Co. 50-CC HANOVER RD., FLORHAM PARK, N. J. • FRONTIER 7-6000

You DON'T Need

BOLTS WASHERS NUTS PINS

or Special Tools to install

Chalfant

Cable Support Systems

Chalfant Splice Plates and Trays are securely fastened by the exclusive Chalfant Crimping Method . . . to reduce installation time way below conventional methods. Lower costs are also achieved with Chalfant systems because each splice plate and tray is made from high quality, longer lasting, economical Aluminized steel.

You'll save 15% on material and 40% on installation when you use Chalfant Systems to produce a better job.

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Tile Linings
Membrane Linings
Tile Structures

Design,
Construction
and Maintenance

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ENGINEERING AND
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WATERTOWN, N. Y.

Pensacola, Seattle,
Montreal, Vancouver

Consulting Engineers' Calendar

Oct. 2-3. Engineers Council for Professional Development; Annual Meeting, Louisville, Kentucky.

Oct. 5-7. Structural Engineers Association of California; Annual Convention, El Dorado, Sacramento, Cal.

Oct. 7-10. Associations of the Western Building Industries Council; Western Building Industries Exposition, Great Western Exhibit Center, Los Angeles, California.

Oct. 8-11. American Institute of Mining, Metallurgical and Petroleum Engineers and Society of Petroleum Engineers; Fall Meeting, Dallas, Texas.

Oct. 8-12. Water Pollution Control Federation; 34th Annual Meeting, Schroeder Hotel, Milwaukee, Wis.

Oct. 15-19. Prestressed Concrete Institute; National Convention, Brown Palace and Cosmopolitan Hotels, Denver, Colorado.

Oct. 15-20. American Institute of Electrical Engineers; Fall General Meeting, Statler-Hilton Hotel, Detroit, Michigan.

Oct. 16-20. American Society of Civil Engineers; Annual Convention, Hotel Statler, New York, New York.

Oct. 17. American Institute of Consulting Engineers; Annual Dinner Meeting, Waldorf-Astoria Hotel, New York, New York.

Oct. 19-20. University of Wisconsin Extension Division and Region 7, Construction Specification Institute; Engineering Institute on "Preparing Construction Contracts and Specifications," Campus, Madison, Wis.

Oct. 19-20. National Society of Professional Engineers; Fall Meeting, Roanoke Hotel, Roanoke, Virginia.

Nov. 2-4. Consulting Engineers Council; Semiannual Meeting, Golden Gate Hotel, Miami Beach, Florida.

Nov. 6-9. Atomfair-61, in conjunction with annual meetings of American Nuclear Society and Atomic Industrial Forum, Conrad Hilton Hotel, Chicago, Illinois.

Nov. 13-17. American Public Health Association; 89th Annual Meeting, Cobo Hall, Detroit, Michigan.

Nov. 26-Dec. 1. American Society of Mechanical Engineers; Winter Annual Meeting, Statler Hilton, New York, New York.

Nov. 27-Dec. 1. 28th Exposition of Chemical Industries, New York Coliseum, New York, New York.

Dec. 3-6. American Institute of Chemical Engineers; General Meeting, New Yorker Hotel, New York, N. Y.

Jan. 15. American Institute of Consulting Engineers; Annual Meeting, Engineers' Club, New York, N. Y.

Jan. 25-27. National Society of Professional Engineers; Annual Winter Meeting, King Edward Hotel, Jackson, Mississippi.

Feb. 12-15. Air-Conditioning and Refrigeration Institute, 12th National Exposition, Great Western Exhibit Center, Los Angeles, California.

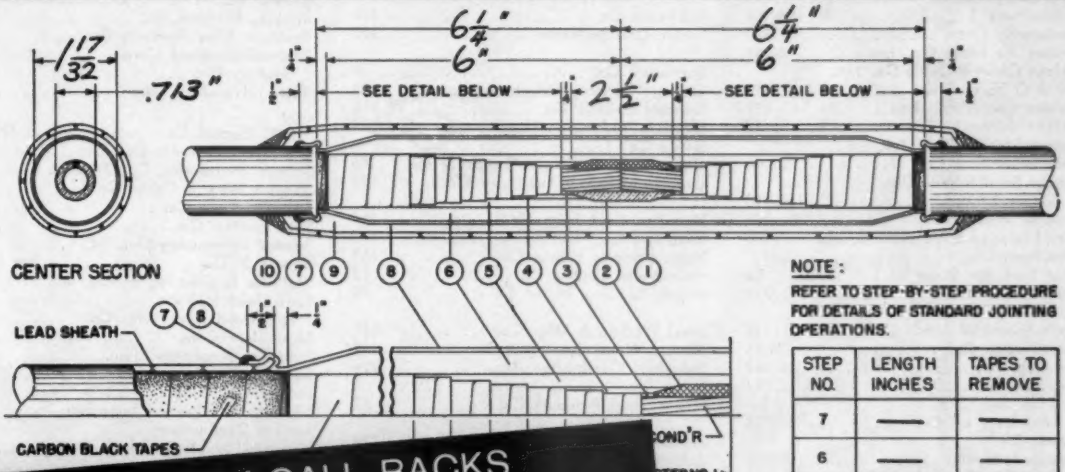
Feb. 19-23. American Society of Civil Engineers; Convention, Hotel Shamrock, Houston, Texas. ▲▲

FOR John Doe Electric Company
C.O. NO. 43967 ITEM 2
F.O. NO. 2-A-3695 ITEM 2
NO. OF UNITS 30
BY JEH DATE 4/5/61
APP. ACL DATE 4/5/61

ANACONDA WIRE & CABLE CO.
ENGINEERING DEPARTMENT — ANACONDA — HASTINGS-ON HUDSON, N.Y.

UNIT PACKAGE
JOINTING MATERIAL

STRAIGHT JOINT FOR TYPE CB PAPER-LEAD CABLE
ONE CONDUCTOR, SIZE 4/0 ~~AWG~~ MCM
CONDUCTOR SHAPE ROUND
INSULATION THICKNESS .175" ~~.164"~~
LEAD SHEATH THICKNESS .090" ~~.164"~~
RATED VOLTAGE 15 KV ~~GRD.~~ UNGRD.



NOTE:
REFER TO STEP-BY-STEP PROCEDURE FOR DETAILS OF STANDARD JOINTING OPERATIONS.

STEP NO.	LENGTH INCHES	TAPES TO REMOVE
7	—	—
6	—	—
5	6	CB TAPES
4	3 3/4	11
3	3	8
2	2 1/4	7
1	1 1/2	ALL

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ITEM NO.	DESCRIPTION	QUANTITY PACKED	
1	LEAD SLEEVE 2" IN. I.D. x 16 IN. LG. x 8/64 IN. WALL	1	
2	SPLIT TINNED COPPER CONNECTOR, SIZE 4/0 AWG MCM	1	
3	V.C. TAPE, 3/16 IN. WIDE x 4 YD. PER ROLL	1 ROLLS	OIL PACKED IN #300 SUPERSEAL
4	V.C. TAPE, 1/2 IN. WIDE x 4 YD. PER ROLL	1 ROLLS	
5	V.C. TAPE, 3/4 IN. WIDE x 4 YD. PER ROLL	2 ROLLS	
6	V.C. TAPE, 1 IN. WIDE x 4 YD. PER ROLL	9 ROLLS	
7	BAR SOLDER	1/2 LB.	
8	COPPER MESH TAPE, 3/4 IN. WIDE x 6 YD. PER ROLL	1 ROLLS	
9	FILLING COMPOUND, NO. 150 SUPERSEAL	2 PINTS	
10	WIPING SOLDER	2 LB.	
11	FLUSHING COMPOUND, NO. 250 SUPERSEAL	1 PINTS	
12	STEARINE FLUX	1 OZ.	
13	PAPER PASTER	4	
14	COTTON TAPE, 1 IN. WIDE x 3 YD. PER ROLL	1 ROLLS	
15	COTTON YARN 1/8 OZ. PER ROLL	1 ROLLS	
16	WASTE ENDS	2 OZ.	
17	ALOXITE CLOTH	1-1FT. ROLL	

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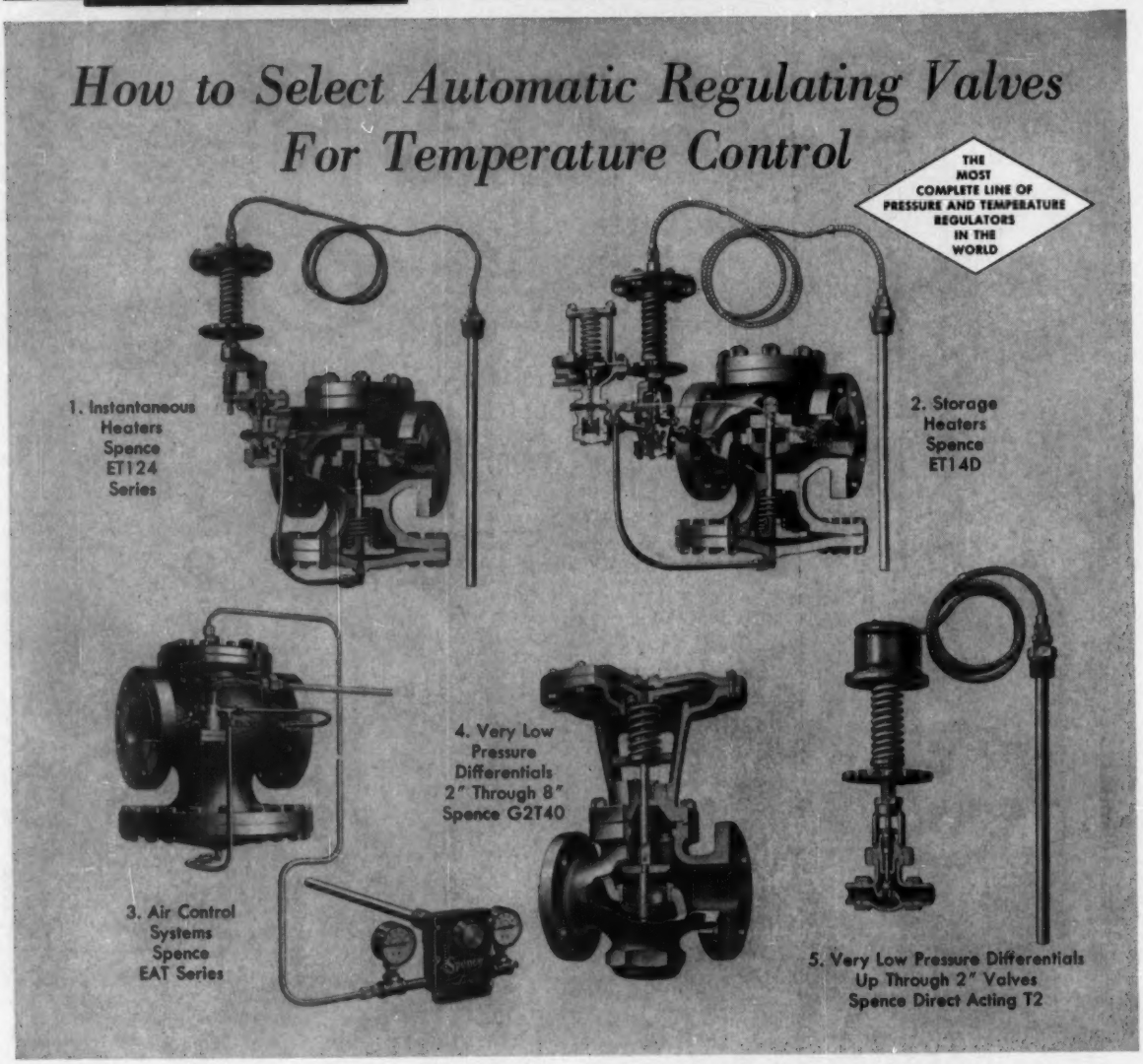
VALVE TIPS:

How to Select Automatic Regulating Valves For Temperature Control


THE MOST COMPLETE LINE OF PRESSURE AND TEMPERATURE REGULATORS IN THE WORLD
1. Instantaneous Heaters Spence ET124 Series
2. Storage Heaters Spence ET14D
3. Air Control Systems Spence EAT Series
4. Very Low Pressure Differentials 2" Through 8" Spence G2T40
5. Very Low Pressure Differentials Up Through 2" Valves Spence Direct Acting T2

During the past year, our field representatives have reported many cases of improperly, and uneconomically, applied temperature regulators. To help you avoid some of these costly mistakes, here are a few tips on selecting the most effective and economical temperature regulating valves for your applications.

1. Instantaneous heaters require a special action for close temperature control and freedom from hunting. In the Spence ET124 series, steam pressure is modulated according to temperature (demand) and is automatically regulated at any pressure established by the demand.
2. Storage heaters, on the other hand, are more economically controlled by the Spence ET14D, which includes a simple temperature-actuated pilot that opens and closes the main valve to maintain a constant temperature.
3. Air control systems can now have a ±5°F control accuracy under wide and instantaneous load swings with the Spence EAT regulator. Engineers report savings of up to 50% in installed costs with this recently developed Spence cascade system when it has been used in place of conventional instrumentation.
4. For the combination of very low pressure differentials and air or water control, Spence recommends Type G2T40. This single seated valve provides fast, positive response in 2" through 8" valves. Double seat Type G22 is also available in 10" through 12".
5. When very low pressure differential is encountered with valves of 2" or less, the Spence direct operated T2 is recommended. The sensitive vapor tension thermostat responds quickly to small changes in bulb temperature for continuous, accurate control.

In this brief description of industrial process and heating temperature control, we have given a few important tips in proper regulator selection. If you would like more detailed information on these control applications, write for the new Spence Temperature Control Bulletin IV 1014. SE-150

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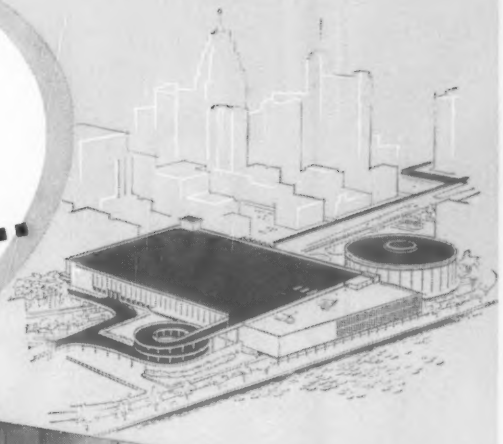
11 SQUARE D SUBSTATIONS SERVE COBO HALL...

World's largest exhibition building, COBO HALL occupies 10 acres of Detroit's Civic Center



...capable of supplying 22,000 KVA of continuous power!

Square D Field Engineer Don Selby *(right)* and Mr. Gil Brandt, COBO HALL Project Electrical Engineer of Giffels and Rossetti, architects and engineers, examining one of the drawout circuit breakers in the low voltage secondary portion of a Square D 2000 KVA double-ended unit substation equipped with nitrogen-filled transformers

Easy, fast installation was a prime objective when eleven Square D unit substations went into COBO HALL. The various sections of each substation were completely coordinated at the factory. Reconnection of those sections at the job site required a minimum of time and labor.

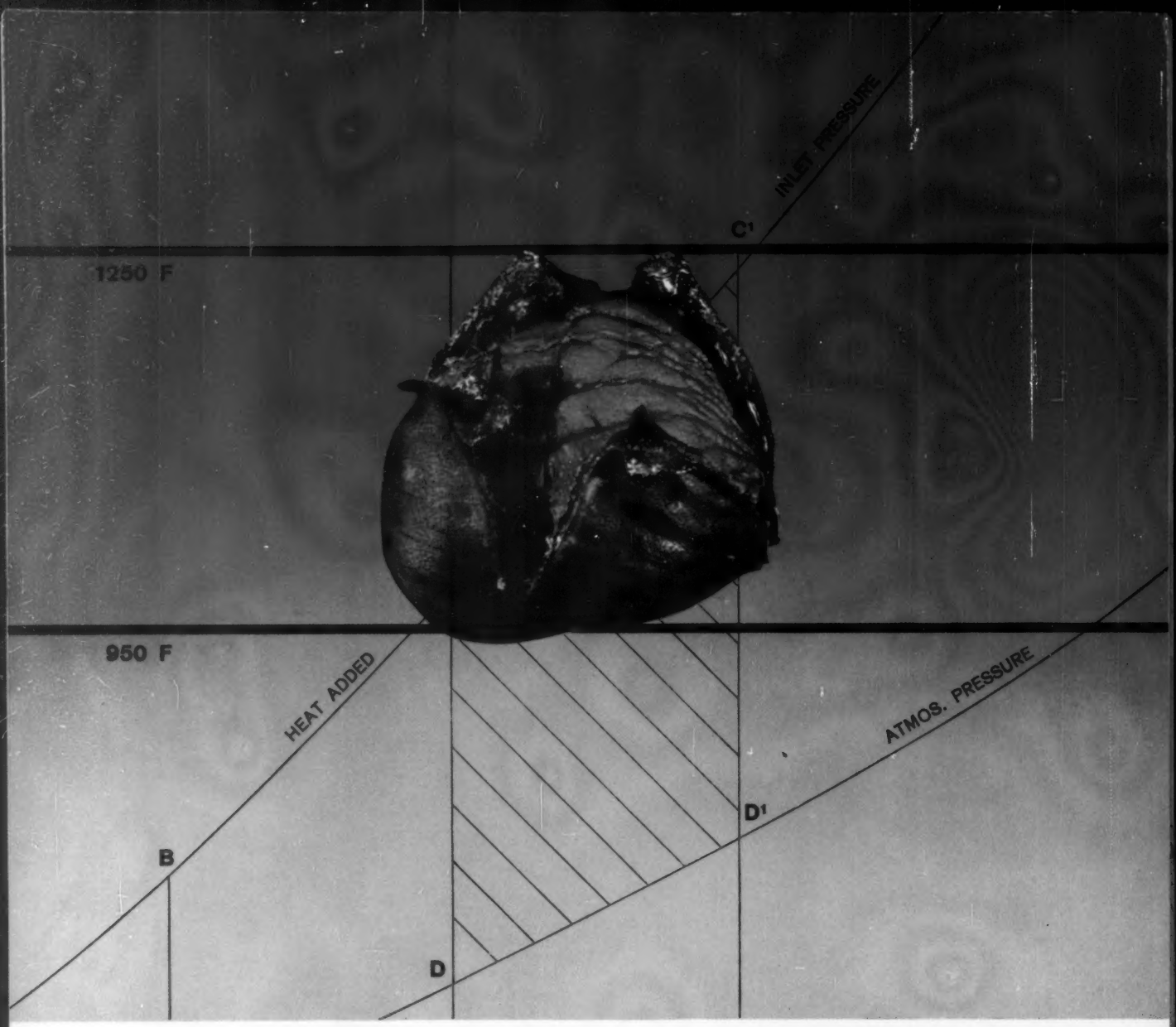
Design leadership is very much in evidence in Square D's broad line of unit substations. We suggest a three-point comparison to prove the point—ease of installation, minimum maintenance, maximum safety for both equipment and personnel.

AMONG OTHER SQUARE D EQUIPMENT IN COBO HALL

37 Motor Control Centers
28 Switchboards
550 Panelboards
100 Contactor Panels
1 Mag. Amp. Dimmer Board
10 Dimmer Panels
64 NEMA 4 Circuit Interrupters
120 Spotlight Control Panels
19,000 feet of Lay-In Duct

SQUARE D COMPANY

wherever electricity is distributed and controlled



THE POWER RECOVERY "CHESTNUT"

or how to take power from 950F—1250F tail gas

A proven method for taking mechanical power from process tail gas below 950F is the turbine. Taking power from tail gas above this temperature has, in the past, been a power recovery "chestnut"—too hot to handle despite its desirability. But now, Worthington offers a Power Recovery turbine that can successfully pluck the meat from this very hot "chestnut."

The "meat" is extremely tasty. Frequently, if tail gas can be put to work at 1250F instead of 950F, as much as 12 to 15 per cent more power can be captured. In some installations, the heat exchangers that formerly handled the drop to 950F can be eliminated. In others, thermodynamic analysis will now show the feasibility of heating the gas to 1250F to get maximum mechanical power recovery.

In the past, use of Power Recovery turbines at the higher temperatures has been impractical. One major problem has been in mechanical design. Misalignment caused by excessive thermal expansion, higher temperature sealing, rotor construction, and forces imposed on the expander by inlet piping expansion and construction are all part of the problem. Today, Worthington has minimized them by creating a new design and using new materials.

A second major problem area that Worthington has overcome is analysis of the gas itself. Most tail gases are mixtures and their behavior is not fully plotted at the temperatures involved. But the behavior must be known before the turbine can be designed. Today, Worthington is ready to analyze the heat recovery potential of any gas or gas-steam mixture and to design a Power Recovery turbine to match.

If you would like to taste the meat of this power recovery chestnut, above or below 950F, write or call Worthington Corporation, Turbine Division, Dept. 48-14, Wellsville, N.Y.

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